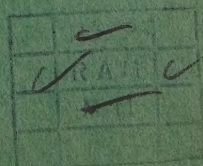


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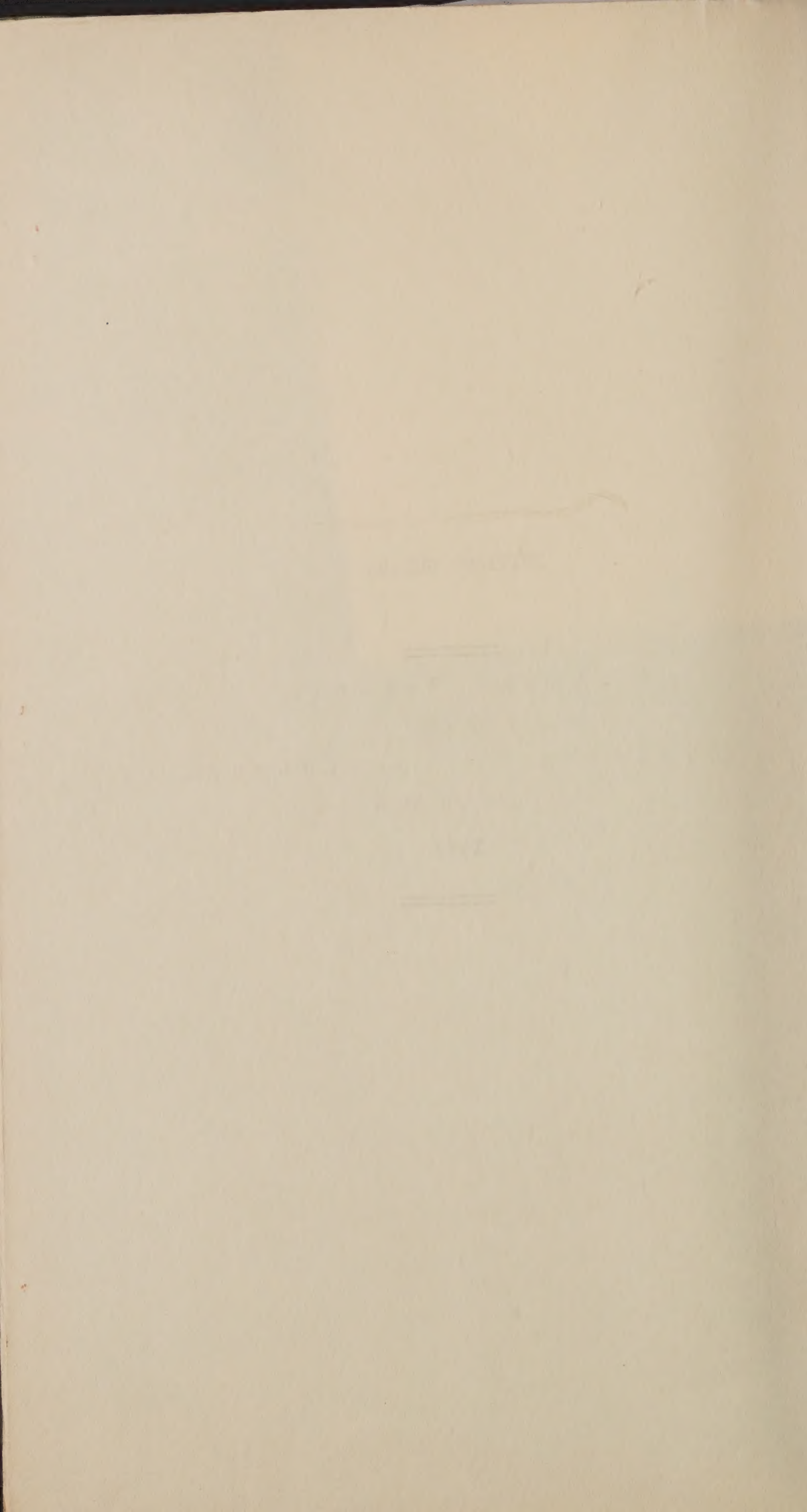
BRITISH GUIANA

ANNUAL REPORT
OF THE
DIRECTOR OF AGRICULTURE
FOR THE YEAR
1960



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C O N T E N T S

Preface - Statement of Policy

SECTION I

AGRICULTURE IN THE COLONY

	<u>Page</u>
Weather Conditions	3
Crops -	
Sugar	3
Rice	6
Coconuts	11
Coffee	13
Citrus	14
Food Crops	14
Cacao	14
Livestock	
Milk	15a
Beef	16
Hides	17
Pigs	17
Sheep & Goats	19
Poultry	19
Beekeeping	19
Fisheries	20

SECTION II

DEPARTMENT OF AGRICULTURE

ORGANISATION	21
Staffing	22
Training	23
Technical Assistance	23
Conferences and Meetings held in other Territories	25
General	26

RESEARCH AND EXPERIMENTATION

Organisation of the Research Service	26
Other Research Organisation	27
Sugar Cane	27
Rice	30
Grasses	36
Coconuts	40
Citrus	42
Cocoa	43

THE EXTENSION SERVICE

Programme of Work	44
---------------------------	----

Extension Methods	..	..	45
(i) Individual Methods	..	..	45
(ii) Group Methods	..	..	46
(iii) Mass Methods	..	..	46
Services to Farmers	..	..	47
Pure Line Seed Padi	..	..	47
Economic Plants and Breeding Stock			48
Duty Free Petrol			53
Local Local Authorities	..	..	54
Regional Development Committees		..	54
Machinery Hire Pools	..	..	54
Crop Valuation	..	..	54
Agricultural Education & Information			54
Rural Youth	..	..	55
Special Duties			
(i) The Peasant Sugar-cane Farming Industry			59
(ii) Beekeeping			60
VETERINARY SERVICES AND ANIMAL HUSBANDRY			
Organisation	..	..	63
Animal Health	..	..	64
Animal Husbandry	..	..	65
Animal Breeding Policy	..	..	65
Livestock Farm (Central Agricultural Station)			66
Ebini Livestock Station	..	..	67
St. Ignatius Livestock Station		..	70
FISHERIES			
Research	..	..	72
Extension	..	..	73
MARKETING DIVISION			
Policy	..	..	74
Government Produce Depots	..	..	74
Processing Factory	..	..	75
Ham and Bacon Factory	..	..	77
Fish Marketing Centre	..	..	77
Milk Pasteurisation Plant	..	..	78
Economics Division	..	..	78
Botanic Gardens	..	..	79
Plant Protection Service	..	..	79
Meteorological Division	..	..	80

SECTION III

LEGISLATION

Summary of Legislation affecting Agriculture Enacted during 1960	81
--	----

SECTION IV

(i) Boards And Committees	81
(ii) Senior Staff Changes	82
(iii) Senior Staff List, 1960	82

SECTION I

AGRICULTURE IN THE COLONY

The contribution made by agriculture and fisheries to the national income was the highest in history. This notable achievement was marked by striking increases in production in almost every sphere of activity. The following table points to some of the more significant results:-

Table I

Production of Major Products

	<u>1959</u>	<u>1960</u>
Sugar	284,425 tons	334,441 tons
Rice	104,075 tons	126,133 tons
Copra	3,432 tons	5,583 tons
Milk	2,689,000 gallons	2,848,000 gallons
Cattle slaughtered	20,894 head	21,642 head
Broilers	850,000 lb.	1,096,650 lb.
Shrimp (export grade)	1,206,336 lb.	2,613,300 lb.

The expansion of production ensured the attainment of new levels of exports. The total value of agricultural and fish products exported was \$82,020,090. This figure is the highest on record and represents 65.6% of total exports. Table II shows the growth of exports from 1955 to 1960. Table III hereunder gives exports of the major agricultural and fish products in 1959 and 1960.

Table III

Exports of Major Products

	<u>1959</u>	<u>1960</u>
Sugar	255,156 tons (\$46,361,113)	308,992 tons (\$57,539,948)
Rice	49,180 tons (\$12,535,728)	63,180 tons (\$15,408,349)
Copra meal	NIL	142,800 lb. (\$5,712)
Plantains	1,623,909 lb. (\$73,833)	3,675,499 lb. (\$166,519)
Maize	160,380 lb. (\$6,015)	224,102 lb. (\$11,205)
Beef	47,562 lb. (\$17,219)	92,638 lb. (\$33,112)
Cattle	212 head (\$36,859)	240 head (\$40,520)
Hides	341,788 lb. (\$32,370)	396,911 lb. (\$42,397)
Shrimp	1,140,566 lb. (\$744,643)	2,522,568 lb. (\$1,651,587)

TABLE II

Value of Exports of Agricultural Produce - (F.O.B.) Excluding Ships' Stores/Bunkers.

Commodity	1955 \$	1956 \$	1957 \$	1958 \$	1959 \$	1960 \$
Live animals chiefly for food	-	-	9,504.	94,620	54,587	54,234
Meat and meat preparations	-	3,829	40,703	33,032	18,361	35,353
Dairy products, eggs and honey	522	84	23	82	373	86
Fish and fish preparations	1,568	1,583	5,348	1,558	744,687	1,651,265
Cereals and cereal preparations	12,518,684	9,852,092	9,765,531	4,822,170	13,838,088	15,408,349
Fruits and Vegetables	6,284	17,618	23,173	64,223	110,073	213,034
Sugar and sugar preparations	41,018,639	42,615,047	55,763,576	57,276,288	48,702,237	60,245,318
Coffee, tea, cocoa, spices and manufactures thereof	309,646	382,944	316,588	281,754	324,922	270,687
Feeding Stuff for animals (not including unmilled cereals)	114,820	122,794	163,445	118,416	119,791	320,569
Miscellaneous food preparations	3,419	4,873	11,589	20,022	19,836	24,627
Beverages	3,243,589	3,879,597	4,125,772	3,568,941	3,625,548	3,128,839
Hides, skins and fur skins, undressed and leather	26,137	39,517	45,106	51,709	49,136	54,861
Textile fibres not manufactured into yarn, thread or fabrics						
ans waste	7,257	2,877	6,772	7,257	3,805	380
Animal and vegetable crude materials, n.e.s.	326	462	673	2,063	3,545	3,036
Animal and vegetable oils (not essential oils), fats, greases, and derivatives.	2,458	19,300	-	-	-	-
Chemical Elements and Compounds	-	-	-	1	110	1
Essential Oil - Lime/and other essential vegetable oils (excluding turpentine) Soaps - soft, resin, hard in bars, etc. principally for laundry washing.	10,060	12,428	27,048	44,274	45,253	584,063
Miscellaneous Chemical materials and products - starches etc., glue and size and dressings, casein, albumen, gelatin, etc.	2,026	3,343	4,711	21,567	40,815	25,358,
Total Value of Agricultural Produce	57,265,435	56,958,388	69,709,562	66,407,977	67,701,097	82,020,090
As a percent of Total Domestic Exports	64.3%	61.0%	65.1%	68.9%	66.4%	65.6%
Total Value of all Domestic Exports - Excluding Ships' Stores/Bunkers.	89,059,183	93,351,449	107,022,177	96,346,689	101,997,382	125,007,990

The rise and trend of agricultural production is revealed also in import returns for tractors and combines, viz.

	<u>1959</u>	<u>1960</u>
Tractors	390 (Valued \$1,393,945)	777 (Valued \$2,229,454)
Combines	21 (Valued \$348,141)	128 (Valued \$1,188,665)

The progress attained reflected the impact of Government's policy of encouragement, protection and development of agriculture which has ensured an expansion of the area under cultivation, more adequate drainage and irrigation of coastal lands, greater security of tenure for small farmers, improved agricultural research, extension and administrative services, availability of more credit and general stability of the domestic and through trade agreements also the export markets for certain products. Satisfactory weather, good labour conditions and increased efficiency on farms, ranches and plantations have also contributed to the final out-turn of the farmers' activities.

POLICY

The agricultural policy of Government as it relates to the work of the Department of Agriculture is

- (1) to undertake research to improve the productivity of existing crops and livestock and to discover new varieties and types of crops and new breeds of livestock adaptable to the territory. To search for new fishing grounds, to conserve fishery resources, and to adopt new techniques to increase the production of inland and marine fishes;
- (2) to provide educational and extension facilities for all members of the farm family so as to enable the farmer and his family to use research findings and to apply improved techniques and practices on the farm and in the home. To employ similar measures to the fishing industry;
- (3) to organise and rationalise production, marketing and processing, particularly on cooperative lines, so as to ensure that the producer obtains the maximum return from his land, for his labour, and for capital used;
- (4) to make available for productive use, particularly by the unemployed and underemployed, after comprehensive soil surveys, increasing areas of land from the large undeveloped land resources of the country;
- (5) to provide a climate for prosperity in agriculture and fishing by introducing appropriate legislative and administrative measures and by providing necessary facilities, services and materials for efficient production, marketing and processing;
- (6) to coordinate the above activities with the work of other agencies (e.g. Credit Corporation, Producers' Associations, Marketing Boards) and private interests concerned with the development of agricultural resources of the country.

This policy is expected to result in -

- (i) an increase of exports of existing crops, livestock and fishery products. For example, sugar, rice, cattle, and shrimp;
- (ii) diversification of agriculture by production of additional agricultural and fishery products for export and for replacing imports of certain agricultural and fishery products. Examples are Cacao, Coconuts, Dairy Products, Meat, Poultry, Fish and Citrus;
- (iii) a reduction of food imports generally by increasing local production of vegetables, root crops, fruit, condiments and legumes.

WEATHER CONDITIONS

The total rainfall for the year at the Georgetown Meteorological Station was 83.90 inches as compared with 78.45 inches in 1959. The average annual precipitation was 92.31 inches over the past 80 years (1880 - 1959).

The rainfall was below average during the first four months of the year. During this period the rainfall, month by month, commencing from January was 6.51, 1.79, 2.67 and 5.28 inches, and was fairly well distributed. The long wet season commenced as usual in May, and ended in August. There was also a normal succeeding dry season. The Christmas rains were not heavy but well distributed. -

Rain fell on 204 days of the year as compared with 221 days in 1959, the highest fall for any one day was 2.04 inches on the 14th December which was well below the record of 7.65 inches on 1st December, 1936.

The highest shade temperature for the year was 89.8°F on the 24th September and 5th October, and was below the record of 93° on 22 nd September, 1955.

CROPS

SUGAR

Organisation of the Industry

Sugar is produced from sugar cane grown mainly on plantations ("estates") owned by two large companies. These companies also operate factories which produce raw sugar for local consumption and for export. Peasant cane farmers cultivate a small quantity of sugar cane for sale to the factories in their vicinity.

The Sugar Plantations are well organised and in addition to employing a large labour force, make full use of mechanical equipment in the field, including the use of aircraft for applying insecticides, weedicides and fertilisers. The aim of the plantations is to provide full employment for a fixed labour force, rather than part time employment for a large number of workers.

The plantations employ a staff of qualified agricultural scientists and other technical personnel and are virtually independent of Government for technical assistance. The Department of Agriculture concentrates its

efforts on assisting the small farmers with technical guidance. In addition, the Director of Agriculture serves as Chairman of the Rehabilitation and Price Stabilisation Fund Committee and of the Sugar Experiment Station Committee.

Output

The total production of sugar was 334,441 tons of which 329,044 tons were produced by plantations and 5,397 tons by farmers. Comparative figures for 1959 were 285,820 tons and 4,328 tons respectively. The Estates harvested 91,629 acres of cane as compared with 83,166 acres the previous year. The average yield of sugar per acre on estates was 3.59 tons of raw sugar per acre as compared with 3.37 tons per acre for the previous year. Low yields on peasant farms reduced the average yield for the colony to 3.41 tons per acre. This increase in the average yield for the colony and on estates was due to better weather conditions and to higher technical efficiency.

Table IV gives an analysis of sugar cane production in the administrative districts of the colony.

Varieties

The varieties grown were virtually unchanged from 1959. The dominant varieties were B41227 and B37161 which occupied 42% and 36.1% of the total area under sugar cane in the colony. Tabel V shows the distribution of the varieties in 1960 compared with 1959.

TABLE V

Distribution of Sugar Cane Varieties

Varieties	Percent of Total Area in the Colony	
	1959	1960
Co.419	0.7	0.7
B.4098	2.2	1.2
B.37161	38.9	36.1
B.41227	37.6	42.00
B.4362	2.2	2.0
D.37/45	0.3	0.4
B.46378	0.3	0.3
B.47225	4.3	3.9
B.47258	7.3	7.2
B.47379	0.5	0.5
Pindar	2.4	2.2
B.4373	0.2	0.2
B.45137	0.4	0.7
B.47419	0.4	0.2
B.49119	0.2	0.2
B.4942	-	0.2
D.141/46	-	0.3
Other Varieties	2.1	1.7

The Sugar Experiment Station at Sophia, which is maintained by the Sugar Companies, continued its main work of testing varieties bred at the Central Sugar Cane Breeding Station in Barbados. In addition, a number of Barbados/emerara and Demerara seedlings were tested. Testing of varieties for resistance to Leaf Scald disease was also carried out.

TABLE IV.

Sugar and Rum production in the administrative districts of British Guiana
1959 - 1960.

Year	Area Reaped (including farmers' Canes), English Acres.			Sugar Produced (including Farmers' Canes) tons.			Yield per acre-tons			Rum Produced - Proof Gallons		
	Berbice	Demerara	Colony	Berbice	Demerara	Colony	Berbice	Demerara	Colony	Berbice	Demerara	Colony
1959	36,047	53,087	89,134	115,522	168,903	284,425	3.20	3.18	3.19	760,121	2,195,775	2,895,896
1960	39,917	58,177	98,794	132,097	202,344	334,441	3.31	3.48	3.41	763,108	2,134,667	2,897,775

Fertilisers

Table VI sets out the quantities and value of fertilisers used by the Sugar Industry. The total quantity used was 31,309 tons valued \$2,662,301 and 13,377 tons of limestone valued \$302,238, compared with 27,809 tons valued \$2,855,318 and 13,085 tons of limestone valued \$318,954 in 1959. It will be seen that while the use of fertilisers increased, there was a decline in prices and consequently in the value of these materials. Sulphate of ammonia continued to be the most important of all the fertilisers used accounting for more than half of the total quantity and value.

Insect Pest and disease control

The year 1960 was characterised by a heavy increase in borer damage, particularly the Giant borer Castnia licus. The infestation was controlled by flooding of field for 48 hours and treating the dam bed stools of sugar cane with aldrin.

Damage by rats was substantially less than in 1959. Anticoagulant and endrin pellets kept these pests under control.

Leaf Scald disease (Xanthomonas albilineans) which seriously threatened the industry a few years ago is now completely under control. The present dominant varieties 37161 and B41227 are resistant to the disease.

Marketing

Total exports of sugar amounted to 308,992 tons valued \$57,539,948 compared with 225,156 tons valued \$46,361,113 in 1959 - an increase of 53,836 tons valued \$11,178,835. The quantity of sugar sold on the local market increased from 18,956 tons in 1959 to 19,632 tons in 1960. The quantity of sugar sold to the United Kingdom under the Commonwealth Sugar Agreement was 167,724 tons priced at \$213.32 per ton compared with 159,630 tons priced at \$216.48 per ton in 1959. The permanent export quota for the colony to the United Kingdom under the Commonwealth Sugar Agreement enabled producers to export only a part of the total crop at an economic price. The selling price for sugar in the colony has been controlled at the present price of \$160.16 since 1951. The world market price, at which a good proportion of the crop was sold during the year was low and unprofitable. Fortunately, certain quota adjustments as well as a new market outlet in the United States of America for 24,000 tons helped to give producers a modest favourable return on the total sales for the year.

Exports of rum declined from 2,191,372 proof gallons valued \$3,541,771 in 1959 to 1,900,854 proof gallons valued \$3,020,945 in 1960. Local sales of rum increased from 460,904 proof gallons in 1959 to 509,963 proof gallons in 1960.

Exports of molasses increased to 15,767,056 gallons valued \$2,705,411 from 12,353,904 gallons valued \$2,341,450 in 1959.

A slight fall in the average export price of rum and molasses amounting to one cent per gallon and 2 cents per gallon respectively was recorded.

Table VII gives the export trade statistics of sugar and by-products.

Values and Quantities of Fertilizers used on Sugar Estates 1958 - 1960.

[illegible]

Storage and Transportation

In 1960, the Demerara Sugar Terminals Limited completed the erection of bulk storage and loading facilities. This plant has a capacity of 40,000 tons of raw sugar and commenced operations towards the end of the year. The change from storage and shipment in jute bags to 'bulk' marked a historic event in the sugar industry and should have an important effect on the competitive position of sugar producers and their ability to satisfy the specific requirements of their overseas customers.

Cane Farming

Less than 2% of the sugar produced in the colony is made from cane grown by small farmers. The most important area of cane farming is the East Coast of Demerara where it is confined to villages in immediate proximity to factories (located on plantations) at which the cane is bought and processed.

The total production of sugar from farmers' canes was 5,397 tons compared with 4,328 tons in 1959. The production on the East Coast of Demerara was 4,448 tons compared with 3,425 tons in 1959. The remaining production was almost entirely in Berbice.

On the advice of the Director of Agriculture, Government decided to negotiate with the sugar companies (who own the factories) for the purchase of larger supplies of sugar cane from farmers. For several years, the sugar companies had limited the quantity of canes (based on the export market position) which they were prepared to purchase from farmers. This measure had led to considerable discontent among farmers and to inefficient utilisation of lands in the vicinity of plantations, which were more suited to the production of sugar cane than other crops. The sugar companies agreed to the principle that the growing of cane by small farmers should be encouraged and consented to accept farmers' canes from the following areas:-

Plaisance	-	70	acres additional
Betervervagting	-	90	" "
Buxton	-	400	" "
Windsor Forest	-	20	" "
La Jalousie	-	30	" "
East Bank Dem.	-	1330	" (estimated) new area
West Bank Dem.	-	1000	" " " "

Government has proceeded to establish Cane Farming Expansion Committees for the districts concerned to co-ordinate and be responsible for the implementation of the programme.

RICE

Organisation of the Industry

Rice is the dominant crop of the flat coastal belt, where it thrives on the heavy clay soils. It is grown on a wide range of farms, varying in size from an acre or two, cultivated on a part time basis by sugar workers and others, to large mechanised holdings of over 1,000 acres. The average size of holdings is about seven acres. On the large Government Land Settlements, the area allotted to each farmer for rice production is 15 acres. The largest rice producer is the British Guiana Rice Development Company (owned by the Government and the Rice Marketing Board) which cultivates

2,600 acres under conditions of complete mechanisation.

In recent years, small farmers have made increasing use of tractors instead of the traditional oxen. Combines have been purchased cooperatively by small farmers and by large operators for harvesting their crops as well as their neighbours' on a contractual hire basis.

Paddy is milled almost entirely into parboiled rice in the districts of production by a multitude of small mills (some 210) owned by private individuals (millers). There are two large central mills each capable of processing about 25,000 tons of paddy annually. These mills are owned by the British Guiana Rice Development Company.

The domestic and export marketing of rice is controlled by the British Guiana Rice Marketing Board, to which all producers are required, by law, to sell their rice. The Board grades, blends, stores and packages this rice and sells it to distributors locally and to its buyers overseas.

Production

The total area under rice was 195,275 acres, an increase of 16,094 acres over the 1959 figure of 179,181 acres. This area represents the acreage fully cultivated for the autumn or main crop. Of this amount only 24,932 acres were put under a second (or Spring) crop compared with 16,595 acres in 1959.

Total rice production for the year amounted to 126,133 tons compared with 104,075 tons in 1959. The yield of the Autumn crop was 115,560 tons and the Spring crop was 10,573 tons. The yield per acre for the Autumn crop was 0.59 tons compared with 0.57 tons per acre in 1959. The yield for the Spring crop was 0.42 tons per acre compared with 0.13 tons per acre in 1959. The returns for the crop with respect to the main administrative districts are set out hereunder in Table VIII:-

TABLE VIII

Rice Acreage and Yields, British Guiana
1959 - 1960

Year	Total Estimated Acres - Spring and Autumn Crops				Estimated Yield Tons
	Berbice	Demerara	Essequibo	Total	
1959	83,521	75,835	36,420	195,776	104,075
1960	90,210	89,832	40,165	220,207	126,133

The crop was produced under more favourable weather conditions than in 1959 and this factor as well as the increased acreage were the most important reasons for the larger harvest.

The quality of the crop and the yield per acre were superior to the previous year. This was due to better weather conditions and to measures taken to control pests and diseases in the field and the use of better seed and techniques.

Mechanisation

There was further marked progress in the mechanisation of the industry. Imports of tractors (mainly for rice production) rose to 777 valued at \$2,229,454 an increase of 387 over the 390 valued \$1,393,945 imported in 1959. Combine-harvester-threshers imported, amounted to 128 valued \$1,188,665 compared with 21 valued \$348,141 in 1959. The consumption of petrol (duty free) by the industry increased correspondingly from 531,580 gallons to 598,825 gallons in 1960.

General Technical Development

Use of fertilisers, weedicides, fungicides and insecticides - though still on a modest scale, having regard to the size of the industry - showed a marked increase. Sales of fertilisers increased from about 300 tons to 500 tons. A mercurial seed dressing was used on pure strain paddy sold to farmers by the Department of Agriculture with the object of controlling seed borne diseases including Blast (*Utricularia oryzae*) and leaf spot (*Helminthosporium* etc.) The favorable results which were obtained have led to widespread demand by farmers for this material. Similarly, an insecticide was used for treating seed against the rice water weevil (*Lissorhoptrus*). The control of the paddy bug (*Utricularia neocila*) by insecticidal dusting was organised on a large scale jointly by the Rice Producers' Association and the Department of Agriculture and financed by the Rice Marketing Board. An estimated acreage of 30,000 acres was dusted.

Varieties

The dominant variety was No. 79. Variety D110 was popular in some areas. The use of pure seed of these varieties continued to expand. Growers supervised by the Department of Agriculture on Land Settlements (Anna Regina, Cane Grove and Black Bush Polder) supplied 13,301 bags and private growers 494 bags for distribution, mainly through Cooperative Credit Societies, to farmers throughout the colony.

The Department of Agriculture continued to breed and test new varieties. Three varieties which have given higher yields than No. 79 and have the characteristics of good grain length and are non-lodging and non-shattering are undergoing final field trials on farms throughout the colony.

Marketing

The marketing of rice is the statutory responsibility of the British Guiana Rice Marketing Board. The Rice Marketing Ordinance was amended in August 1960 to provide a greater measure of representation for rice producers on the Board. The Board comprises sixteen (16) members, at present, as follows:-

- (a) two officers in the Public Service (at present the Director of Agriculture and the Permanent Secretary of the Ministry of Trade).
- (b) Twelve persons, appointed as follows:-
 - (i) eight rice producers nominated by the Council of the Rice Producers' Association from among its members;
 - (ii) three rice producers who are manufacturers nominated by the Council of the Rice Producers' Association;

(iii) one person nominated by the British Guiana Rice Development Company, Limited.

(c) Two other persons experienced in marketing.

The Chairman and Vice-Chairman of the Board are elected by its members. There is an Executive Committee consisting of the Chairman, the Vice-Chairman and four (4) members elected by the Board.

During its financial year - 1st October 1959 to 30th September 1960, the Board purchased 1,159,089 bags (93,141 tons) of rice (an increase of 451,516 bags over the previous year). Of this quantity, 243,212 bags (19,544 tons) were sold for local consumption and 780,432 bags (62,713 tons) were exported. All export, with the exception of 50 tons, went to the West Indies. The largest customer was Trinidad which purchased 27,148 tons of bulk parboiled rice and 980 tons of packaged rice. Jamaica purchased 15,826 tons of bulk parboiled rice and 3,725 of packaged rice. Barbados bought 8,092 tons of bulk parboiled rice and 133 tons of packaged rice.

Prices

The three-year marketing agreement under which British Guiana supplies the total import needs of the West Indies was renewed without any change in the 1959 prices. There was also no change in domestic buying and selling prices.

The price structure was as follows:-

TABLE IX

Price Structure for Rice

Paddy:- The minimum price for paddy was \$6.80 per bag of 140 lbs. nett for dry cleaned, well-winnowed paddy.

Local Buying Prices 1960

<u>Grade</u>	<u>Price per bag of 180 lb</u>
Extra Super	\$20.70
Super	19.70
Extra No. 1	18.55
No. 1	17.60
Extra No. 2	16.45
No. 2	15.35
No. 3	13.20
Super Broken	9.85
Broken	8.20
Unclassified	7.00
White A	19.70
White B	17.60
White C	15.35
White Broken	10.00

Local Selling Prices

Super	22.15 per bag of 1
Brown A	18.80 -do-
Brown B	14.45 -do-
White A	21.30 -do-
White B	18.80 -do-
White C	17.00 -do-
Brewers Broken	12.00 -do-
Mixed Broken	10.45 -do-
Stock Feed	7.20 -do-
"Pearl Brand"	10.00 per 60 lb.
"Indian Maid"	7.73 per paper bag

Export Prices to the West Indies

(F.O.B. per bag of 180 lb.)

Super	-	\$21.30
1st Quality	-	19.20
2nd Quality	-	16.95

Marketing Improvements

The Rice Marketing Board embarked on a programme to expand its storage and processing facilities in order to accommodate the increasing output and to satisfy the requirements of its customers abroad. The wharf and stores were extended in Georgetown, and contracts were awarded for the erection of new bonds at Springlands and the Corentyne.

A new processing plant at Georgetown was nearing completion. This plant will incorporate a remilling section with equipment for milling and polishing rice and for extracting excess broken grains. It will also be fitted with modern equipment for removing discoloured grains viz., precision graders, picking tables, and electronic graders. Other equipment includes storage and fumigation silos, and packaging machines. The capacity of the plant is 12,000 tons of packaged rice per annum.

British Guiana Rice Producers' Association

This Association represents the rice producers of the Colony. It elects and selects the majority of members of the Rice Marketing Board, engages in educational activities intended to improve the efficiency of rice production and promotes and defends the interests of the industry generally. The Association was quite active during the year and worked closely with the Department of Agriculture in the field. By an amendment of the Ordinance under which the Association functions, the Director of Agriculture (or his nominee) was made a member of the Association.

The British Guiana Rice Development Company Limited

This Company operates with an issued share capital of \$2,000,000 and capital debentures of \$5,001,600 in favour of the Colonial Development Corporation. The Company is owned by the Government of British Guiana with the Rice Marketing Board as a minority shareholder. The work of the Company is concerned with the operation of two modern rice mills, and the mechanised production of rice.

During the year, Government agreed to the recommendation of the Director of Agriculture that the rice farm of the Company should be operated on a commercial basis and that the Department of Agriculture should be responsible for research on mechanised rice production. The Director of Agriculture was appointed as Chairman of the Company. A new General Manager was also appointed. These changes resulted in re-organisation of the Company's activities and the introduction of new policies and procedures.

The noteworthy achievements of the Company for the year 1960 include:-

- (a) A net profit of \$19,944 on the rice farm. 2,378 acres were cultivated and yielded 32,098 bags of

paddy (140 lb, each) or a yield of 13.5 bags per acre compared with 11.21 bags per acre in 1959 and yields of similar order or less in preceding years.

- (b) Improvement of milling techniques and operational control which should produce a profit of some \$30,000 for the financial year 1960/1961 compared with a loss of \$378,061 for the financial year 1959/1960.

Rice Milling

An attempt by Government to introduce legislation to control the erection of rice mills and to expedite the rehabilitation and improvement of mills met with strong opposition from millers and was withdrawn. Nevertheless, the Department of Agriculture undertook to promote the erection of modern rice mills. A paper setting out the advantages of modernisation was prepared by the Director who showed that as a result of inefficient milling, the industry was losing over \$3 million annually by not recovering marketable by-products, by producing low grades of rice and by recovering less rice. The paper was given considerable publicity. In addition, a flow chart with explanatory details of recommended equipment for multi-stage mills was distributed to all millers. The British Guiana Credit Corporation began issuing loans to millers who wished to improve their equipment. These measures resulted in the erection of eight multi-stage mills while some thirty (30) applications have since been received from millers requesting permission to erect new mills.

There is need for the industry to instal better milling equipment as rapidly as possible in order to produce the qualities of rice which our expanding markets demand. Unless efficient rice mills are available in all districts, the increasing output of rice would not be properly processed to satisfy the exacting requirements of export markets. Such a situation could have a serious adverse effect on farmers' prices and the disposal of the crop,

COCONUTS

Organisation of the Industry

Coconut is the third crop of importance and is grown on an estimated 35,300 acres. The palm occurs as scattered plantings among food crops and along dams and roadways in villages, as a fruit crop on house lots, and as a monoculture on large farms or estates of up to 1,000 acres in size. The coastal 'sand reefs' produce the best yields. However, good returns are obtained on the coastal plain generally, particularly on irrigated areas drained by the smaller rivers and creeks.

Oil is expressed from copra locally by two large mills owned by private enterprise in Georgetown. However, the fresh mature kernel of the nut is also processed into crude oil as a village cottage industry. This oil is consumed in the rural areas and the residue from its manufacture is fed to pigs.

There is a thriving local soap, margarine and refined oil industry based in Georgetown.

Output

Favourable weather for growth and for the preparation of copra was experienced during 1960. The yield of nuts was estimated at 43,969,000 which contributed to the production of 5,583 tons of copra and 63,191 gallons of 'village crude oil' compared with 3,432 tons and 86,282 gallons in 1959 respectively. It will be observed that there was a further decline in village production of crude oil - an activity wasteful of oil which is not recommended by the Department. The increased output of copra resulted in higher production of its derivatives viz., edible oil, soap, margarine and lard compound and copra meal. The following table shows production of these products since 1957:-

TABLE X
OUTPUT OF COCONUT PRODUCTS

Year	Copra (tons)	Copra Meal (lbs.)	Edible oil (Gals.)	Crude Oil (Gals.)	Soap lb.	Margarine Compound Lard
57	5,370	3,814,412	676,731	147,339	4,777,727	1,642,23
58	4,832	3,432,358	623,835	109,729	4,012,976	1,920,97
59	3,432	2,440,165	445,350	86,282	3,748,514	1,778,55
60	5,583	3,705,045	681,545	63,191	4,094,011	1,845,63

Grading and Prices

Copra grading and prices continued to be controlled by Government. The Regional Oils and Fats Conference, of which the colony is a member decided to increase the area export price of copra to \$340 per ton f.o.b. and of raw oil to \$2.53 per gallon f.o.b.

Local prices for copra were:-

Grade 1	-	\$302.40
Grade 2	-	291.20
Grade 3	-	280.00

The local wholesale price of deodorised coconut oil was fixed at \$2.48 per gallon.

Expansion of Production

Under the Development Programme, a target was set to plant or replant 2,000 acres annually. The returns from the districts show that this target was exceeded by 574 acres as follows:-

Essequibo	-	860 acres
Berbice	-	964 "
East Demerara	-	620 "
West Demerara	-	300 "
Other areas	-	100 "
Total		<u>2,574 acres</u>

This achievement was secured by the efforts of the Extension

Staff, by the payment of a bonus of \$20.00 for each acre of new plantings, and by the supply of selected seedlings by the Department of Agriculture at the subsidised price of 5¢ each. The total number of seedlings distributed by the Department was 150,000 of which 135,000 were produced at the Central Agriculture Station and the balance at district sub-stations.

Technical Developments

One striking effect of the Bonus Scheme for coconuts is that new orchards are planted in accordance with the advice of the Department of Agriculture. Good preparatory cultivation, efficient field drainage and correct spacing between plants, which are the requirements for the award of the bonus should result in higher yields from new cultivations than from the present acreage.

The rehabilitation of existing groves, the use of mechanical weed cutters and the application of limestone and fertilisers and the use of insecticides are practices which have begun to be adopted by farmers as a result of field day and the educational activities of the Department.

Pests and Diseases:

There were no large outbreaks of pests or diseases. The coconut borer (Brassolis sophorae) occurred in small areas, particularly near to Georgetown. The moth borer (Castnia jocosella) attacked palms in several localities and was controlled on some estates by the use of dieldrin. The palm weevil (Eurymecurus palmarum) and the cockle (Stratocelys albicus) attacked palms in the Moruca and Pomeroun areas.

Towards year end, an investigation into the cause of the death of palms in Moruca gave a strong indication of the possible presence of nematodes. Action is being taken to identify the nematodes found on infected palms.

COFFEE

Liberica coffee is produced in the North West District (1,600 acres), on the banks of the Pomeroun River (758 acres) and in the Canals Loker (400 acres). Total production for the year was estimated at 800,000 pounds, compared with an estimated 1,000,000 lbs. in 1959. The decline in output was due to a sharp fall in the coffee price from an average of 48 cents per pound in 1959 to as low as 25 cents per pound at year end 1960. Another contributing factor was an attack of Sclerotium disease on farms of the worn out pegasse soil of the North West District.

Exports of coffee beans, mainly to Holland, fell from 536,704 lb. valued \$312,435 in 1959 to 472,080 lb. valued \$266,741.

The newly formed Co-operative Marketing Societies tried to secure higher prices by improving processing of the beans but the collapse of the world market price made their efforts largely ineffective, although such action helped to prevent lower prices. At year end, coffee farmers were greatly concerned about their economic position. In order to support the local price Government raised import duties on imported prepared coffee. At the same time, the Department of Agriculture in cooperation with the Tropical Products Institute began investigating the possibility of producing 'Instant' coffee from local beans. British Guiana imports \$560,000 worth of Instant coffee annually, which is more than the value of the beans exported.

It is felt that the production of instant coffee locally should give the farmer a greater share of his own home market and should help to maintain prices at a more profitable level.

CACAO

Following successful trials with this crop on the riverain soils and on the lateritic hills of the North West District, it was decided to promote its cultivation under the Development Programme. A bonus of \$30.00 for each acre planted was offered and clonal cuttings and high yielding hybrid seedlings were produced for distribution to farmers at subsidised prices. Since the start of this programme, the world market price for cocoa has fallen to an alarmingly low level. The result has been that farmers are showing very little interest in the crop. A local company which had intended establishing 5,000 acres of the crop is reported to have decided to reduce its target to some 1,000 acres.

During the year, 208,010 plants were propagated at the Department's nurseries. Of this number, 49,963 were distributed to farmers. Large supplies remained on hand at year end. Fortunately, the private company engaged in cacao production absorbed a good deal of the available plants.

There was a small output of cacao beans from the old reclaimed farms. The Marketing Division purchased 15,367 lb. of these beans; the quality of which was unsatisfactory. The Department proposes to establish central fermentaries in the important producing areas to overcome the problem of inefficient processing.

CITRUS

The cultivation of this crop is encouraged on the banks of rivers. The estimated new acreage established was 350. The Department distributed 10,919 plants - mainly oranges and grapefruit. A private company planted about 150 acres of limes.

Imports of citrus fruit, notably from Suriname and Trinidad amounted to 1,543,169 lb. compared with 1,346,784 lb. in 1959. There are also large imports of canned juice. It will be seen that an opportunity exists for farmers to satisfy their own local market. To this end, 400 acres of the Garden of Eden Land Settlement, which is near to Georgetown; have been set aside for the production of oranges.

Lime production is being revived by a local company which hopes to establish 1,000 acres. Exports of lime oil amounted to 802 lb. valued \$9,248 and of lime juice 8,325 gallons valued \$11,980. The corresponding 1959 figures were 735 lb. of lime oil valued \$9,173 and 15,179 gallons lime juice valued \$20,179.

Food Crops

The local supply of food crops and corn was larger than in 1959. Exports of plantain amounted to 3,675,499 lb. valued \$166,519 compared with 1,623,909 lb. valued \$73,833 in 1959. Exports of corn also increased to 224,102 lb. valued \$14,567 compared with 160,380 lb. valued \$8,019 in 1959. Practically, the entire local requirement of corn meal was supplied by the Marketing Division which sold 302,977 lb. compared with 245,473 lb. in 1959.

Surplus plantain was converted into flour at the Marketing Division and 30,804 lb. were sold compared with 26,465 lb. in 1959. A trial shipment of one ton was sent to the United Kingdom.

Purchases of food crops by the Marketing Division which guarantees to purchase all surpluses at fixed minimum prices were as follows:-

TABLE XI

Purchases by the Government Marketing Division
in Georgetown.

<u>Food Crops</u>	<u>1959</u>	<u>1960</u>
Plantains	1,858,684 lb.	2,893,122 lb.
Cassava	2,029,889 lb.	1,532,049 lb.
Sweet potatoes	108,496 lb.	122,796 lb.
Yams	50,424 lb.	36,263 lb.
Tannias	6,363 lb.	9,761 lb.
Eddoes	<u>71,368 lb.</u>	<u>102,119 lb.</u>
	<u>4,125,224 lb.</u>	<u>4,696,110 lb.</u>
<u>Corn</u>	<u>1,234,374 lb.</u>	<u>1,671,695 lb.</u>

Exports of cassava starch fell from 370,792 lb. valued \$39,658 to 211,473 valued \$21,595.

The Department launched a campaign to diversify the production of food crops by introducing legumes such as peanuts, blackeye peas, arhar dhall, mung, and pigeon peas, and vegetables such as cabbage and onions. Incentive bonuses were offered for the cultivation of these crops, minimum guaranteed buying prices were fixed by the Marketing Division, and Government undertook to control imports in the event of any difficulty in disposing of local supplies in competition with imports. There were signs at year end of the programme gaining popularity among farmers.

Fruit and Vegetables

There was a good supply of tropical fruit and vegetables on the market. Pineapples, bananas, mangoes and green leafy vegetables were in greatest supply.

Prices

The index of prices for local food and fruit crops showed that prices were somewhat lower than in 1959 and reflected the generally favourable supply position.

Diversification of Crops

In conformity with its policy to introduce new crops into the country in order to diversify agriculture, the Department of Agriculture tested or had under observation a wide range of introductions. The following were showing the greatest promise:-

<u>Castor bean</u>	-	Some Indian varieties
<u>Sesame</u>	-	Venezuelan varieties
<u>Oil palm</u>	-	From Africa
<u>Kenaf</u>	-	From Cuba
<u>Pepper</u> (Piper nigrum)	-	From Sarawak. This crop is being expanded as rapidly as planting material permits.
<u>Fodder</u>	-	Over 140 species or types of grasses and legumes were introduced. Several showed good possibilities.
<u>Papaw</u>	-	For papain extraction
<u>Tea</u>	-	Lowland varieties from Malaya
<u>Clove</u>	-	Introduced through the agency of the International Cooperation Administration.
<u>Cherimoya</u>		
<u>Java Almond</u>		
<u>Passion fruit</u>		
<u>Wed chestnut</u>		
<u>Robusta coffee</u>	-	From Trinidad
<u>Maize</u>	-	Hybrid seed from Venezuela and local selections.

LIVESTOCK

Milk

Dairying is encouraged on the coastal belt in the environs of towns and other large centres of population. Production is organised as a supplementary enterprise on crop farms and on sugar estates, and as a full time commercial activity on specialised small dairy farms. Dairy cattle are of mixed Holstein/Creole genetic complex, the breed improvement policy having been to 'grade up' the local cattle by crossing with Holstein bulls.

Most dairy cattle are fed on cultivated or native cut grass as well as by grazing on largely unimproved pastures.

The estimated production of milk for the year was 2,848,000 gallons compared with 2,689,000 gallons in 1959. The Department operated a modern milk pasteurisation and bottling plant in Georgetown at which most of the milk intended for consumption in the city is purchased at fixed prices. Purchases for the year increased to 622,262 gallons compared with 498,876 gallons in 1959.

Much difficulty was experienced in disposing of increased supply to a population which has grown accustomed to imported processed milk. As a result some 75,000 gallons of surplus milk was distributed at a low price to school children and free of charge to Government Institutions and some charitable organisations.

Prices paid by the Milk Plant for milk were:-

Leguan and West Demerara	.72¢	per gallon
Cane Grove	.86¢	" "
West Coast Berbice	.60¢	" "
East Coast Berbice	.70¢	" "
Georgetown	.80¢	" "
Grade A.T.B. Tested Georgetown.	.96¢	" "

Pasteurised bottled milk was sold at \$1.08 per gallon wholesale and 16 cents per pint retail.

The Department operated a mobile artificial insemination service to farms within the milk shed areas of Georgetown and New Amsterdam. The number of services recorded was 3,060 compared with 3,147 in 1959. During the year, seventy pure bred Holstein heifer calves, selected for heat tolerance, were imported from the United States of America to form the nucleus of a new experimental dairy herd at the Central Agricultural Station. Grade heifers were supplied to settlers on Land Settlements and to farmers. Twenty-six (26) in-calf heifers were distributed to farmers free of charge on the revolving heifer scheme on condition that the heifer calves they produced were returned to the Department for insemination, in due course, and distributed on a similar perpetual basis to other farmers.

Beef

Specialised beef production is concentrated on the savannas of the Rupununi and on three ranches on the coast. In addition, a large number of farmers and land owners keep cattle to provide their households with milk, to produce oxen, and to sell, as beef, those animals which are in excess of their needs or are unsuitable or too old for use.

In order to improve the quality of beef cattle, the Department of Agriculture imported from the United States forty-four (44) head of Brahman and Santa Gertrudis cattle both male and female. Two Research Stations concerned primarily with beef, improving production, are operated by the Department; one at Ebini on the Berbice savannas and another at St. Ignatius in the Rupununi. On the former, the work has shown that fertilised pangola pastures and mineral feeding can produce about 250 pounds of beef per annum per acre from cross bred Santa Gertrudis/Creole cattle. At St. Ignatius Station, the work has indicated that the yield of beef can be increased by improved savanna utilization (fencing, rotational grazing and controlled burning), by grading up Creole cattle with Zebu sires, by mineral feeding and by cultivation of grass e.g. pangola to give young stock

a good start. At least one producer - the largest - in the Rupununi has introduced these measures and has demonstrated their value.

The effective utilisation of the Ebini savannas and the Rupununi savannas by the application of scientific techniques is becoming of increasing importance because cattle are being forced off expensive coastal land by the expansion of crop production. On the coast, Government has set aside areas for communal grazing e.g. Block III Cattle Pasture. However, these areas are not sufficiently large nor is their utilisation properly organised to produce the quantity of beef required for consumption and, in any event, must be surrendered ultimately to the plough as the human population grows.

The output of beef increased during the year. Slaughtering recorded amounted to 21,642 head compared with 20,894 head in 1959. All cattle produced in the Rupununi for the Georgetown market are slaughtered at the Lethem abattoir and their carcasses transported by aircraft to the Georgetown airport of Atkinson Field. The quantity of beef transported in this manner amounted to 1,831,071 lb. compared with 1,392,286 lb. in 1959.

Exports of beef amounted to 92,638 lb. valued \$33,112 compared with 47,562 lb. valued \$17,219 in 1959. All exports were made by aircraft direct from the Rupununi to Cayenne and Martinique. Exports of cattle, exclusively to Suriname via Springlands on the Corentyne, totalled 240 head valued \$40,520 compared with 212 head valued \$17,219 in 1959.

Hides

Cattle hides amounting to 396,911 lb. valued \$42,397 were exported compared with 341,788 lb. valued \$32,370 in 1959. A good deal of hides goes to waste in the Rupununi, particularly in the rainy season, because the high cost of transportation by aircraft to the coast makes marketing unprofitable.

Pigs

The decline of the pig industry was the subject of an investigation by a committee which has not submitted a report since its appointment in 1959. Recorded slaughtering fell from 10,248 head in 1959 to 9,024 head in 1960. The production of bacon and ham suffered both from the poor supply of pigs and from severe competition from imports which were believed to have been dumped at low prices. The quantity produced by the Marketing Division was 10,773 lb. ham and 23,775 lb. bacon compared with 8,752 lb. ham and 27,475 lb. bacon in 1959. The quantity of bacon produced in 1958 was 48,342 lb.

The shortage of pigs led to a general increase of prices. The Marketing Division paid an average of 57.2 cents per lb. for bacon type pigs compared with 54.5 cents per lb. in 1959. The policy of the Department of Agriculture is to encourage the bacon type pig. Towards year end, large white and Landrace boars and Gilts were imported from Canada in order to augment the local supply of good breeding stock.

Sheep and Goats

These animals are reared throughout the country. Most of the meat is consumed on farms. The quantity reaching the Georgetown abattoir, representing a very small percentage of total production, declined from 790 sheep in 1959 to 604 in 1960 and goats from 543 to 447.

Sheep do not thrive on most low lying coastal lands. Better results are obtained on higher ground e.g. coastal sand reef and interior savannas.

British Alpine and a few Saanan goats are reared on a small scale for milk production.

Poultry

Production of poultry is pursued on almost every farm in the colony. It is difficult to estimate both the population as well as the output of the industry. Most of the eggs and poultry meat are consumed by producers themselves while the surplus is marketed.

Commercial broiler production which began a few years ago has increased steadily. It is concentrated mainly on the East Bank of Demerara, near to the airport of Atkinsons to which chicks are consigned by aircraft from the United States of America. The area is also near to Georgetown and Mackenzie - two large centres of consumption.

During the year, a poultry specialist Dr. N. Paulhuysen, who as an International Cooperation Administration Specialist attached to the Department of Agriculture, was largely responsible for fostering the local industry, was invited to review the present situation and to make recommendations. He made a number of useful proposals, including the centralisation of slaughtering and processing in order to ensure greater veterinary and hygienic control as well as to improve marketing efficiency. These proposals are being actively pursued.

The production of broilers, as reported by the commercial producers, was - 1,096,650 lb. compared with 850,000 lb. in 1959. Imports of dressed poultry amounted to 103,527 lb. valued \$81,069. These imports were made mainly during the Christmas season when there was a sharp rise in demand. Imports were to some extent, balanced by exports of 25,000 lb. poultry meat and 87,000 day old chicks.

The output of eggs was not satisfactory. This led to imports of 232,040 valued \$28,531. Farmers appeared to be more interested in producing meat than eggs.

ANIMAL HEALTH

Cattle

Paralytic Rabies is endemic in British Guiana and continues to be a great menace to beef cattle in the Interior. Annual vaccination has reduced deaths from approximately 4,500 in 1956 to less than 750 during the past year. Heaviest losses are currently in young calves under 6 months of age, as vaccination fails to provide a high immunity in young animals. Two members of the staff sent to Trinidad for training in the identification and control of the bats which act as vectors of the disease, returned and began work on this aspect of controlling the disease.

Tick fevers mainly Anaplasmosis and Piroplasmosis occurred frequently but were kept under control.

An outbreak of Anthrax occurred on the Essequibo Coast. Quarantine of the area and vaccination controlled the spread of the disease.

Malnutrition and mineral and protein deficiencies occurred in most areas where husbandry is poor with resultant rachetic conditions, sterility, stunted growth and low production.

Tuberculosis - 1,477 cattle were tuberculin tested of which 1,441 were negative.

Sheep and Goats

Infestation by internal parasites was the main problem.

Poultry

Pullorum testing was carried out extensively among the larger flocks and should result in a great reduction of Salmonellosis.

Newcastle Disease has been controlled effectively by vaccination. A few sporadic cases in back-yard flocks were reported.

Lymphomatosis was widespread, and was responsible for death of many birds. Fifty percent of post mortems of poultry performed at the Veterinary Laboratory revealed the presence of the disease.

Other diseases which occurred regularly were Fowl Typhoid, Histomoniasis and Coccidiosis, but none assumed epidemic proportions.

EQUINES

A suspected outbreak of Equine Encephalomyelitis on the Corentyne Coast was arrested by immediate vaccination.

Trypanosomiasis continued to be a serious problem among horses in the Rupununi district.

BEEKEEPING

The strength of the industry rested mainly with the big producers in the Essequibo, the Polder Canals, West Berbice and on the Corentyne Coast. The smaller producers were scattered over the colony and increases in their number as well as in their production were achieved during the year.

The following table gives the position of the Beekeeping Industry at the end of 1960:-

TABLE XII

Number of	Demerara	Berbice	Essequibo	Total	Increase
keepers	222	78	52	352	13
aries	251	86	58	395	34
onies	1,178	470	462	2,110	55

Production of honey increased from 104,000 lb. to 110,000 lb. - an increase of 6,000 lbs. This was accomplished by an increase of output per colony by the majority of the small producers. The output of bees' wax was about 2,000 lb. The average price of honey was 25 cents per pound and of wax about \$1.40 per pound.

FISHERIES

Principal Fishing Areas

The principal fishing areas are the inland waterways reservoirs, fish ponds and farms and sugar cane flood-fallow fields which supply fresh-water fish. The estuaries are the main sources of the supply of small fish caught by Chinese-seine. The inshore waters along the coast and around the islands of the estuaries are the principal source of pin-seine fish mainly mullets and snook. Offshore, in deep water, is the traditional snapper fishery which extends from off the coast of Cayenne to off the coast of British Guiana in the 70 to 90 fathoms depth. This is operated by 18 snapper vessels which bring their catch to Georgetown. Apart from this, there were two local trawlers and one French and thirty-four American trawlers, which fish offshore for supplies of fish and shrimp. The American trawlers bring in very limited supplies of fish but mainly supplies of shrimp.

General position of the Industry in 1960

During the year, the most significant activity was in fishing and shrimping in the offshore waters by trawlers both local and foreign. This resulted in a large increase in the supply of fish and on the local market and also strained the inadequate local cold storage facilities including those of the Wholesale Fish Market in Georgetown. In general, catches from the estuaries and inshore areas were not exceptional though in the Berbice area, it was indicated that supplies of fish, notably Bangamary, and shrimp were considerable throughout the year. In the inland waterways rivers, canals, etc., the rather prolonged dry spell during this year has facilitated the catching of fish and in the western Berbice area the supply of fish from the swamps has been remarkably increased, perhaps five fold, by the spawning and spread of tilapia in these swamps in that region. The fish has been marketed over a wide area. Dry conditions destroyed most offish in cultivated ponds. In general, however, the fish supply situation was good and production of shrimp by foreign trawlers was exceptionally good.

Output

Landing statistics are available for Georgetown New Amsterdam only and even these are not very complete.

The Government Wholesale Fish Market purchased 550,309 lb. of fish valued at \$231,235.61 mainly from pin-seine and snapper fishing boats (to December 28, 1960) compared with 665,380 lb. in 1959. Production by trawler landed at private docks was 1,114,000 lb. of fish and 2,61 of shrimp. Comparable figures for 1959 were 458,500 lb. fish and 1,206,336 lb. shrimp respectively.

Aquarium Fish Trade

During the year, the total quantity of aquarium exported amounted to 1,340,989.

Efforts to improve production

(i) Fish Culture:- Tilapia is encouraged in ponds and the Department supplies fry to interested farmers.

The brackishwater Fish Culture Station at Onverwagt has been completed this year with the funds provided by the Development Programme. A total of 57 acres of pond was established, each pond has a known population of fish types and is supplied with water from a main canal which connects to the sea.

(ii) Industrial Fishing Development:- During the year, it was clearly indicated that shrimping in the Guiana offshore waters offered tremendous possibilities as a result of the survey by the Departmental vessel "Cape St. Mary", the present activities of trawlers and a recently conducted survey by the United States Fish and Wildlife Service. The number of foreign owned boats operating locally is increasing steadily. Moreover, trawlers with bases in Trinidad and Suriname have begun to exploit the fisheries of the Guiana shelf. Accordingly, every effort was made to stimulate the establishment of local enterprises for exploitation of the offshore trawl fishing and shrimping resources. In addition, a large number of enquiries from foreign companies and individuals were dealt with and every encouragement given to them to base their operations in the colony.

SECTION II

DEPARTMENT OF AGRICULTURE

Organisation

The Department of Agriculture is a Department of the Ministry of Natural Resources and is administered by the Director of Agriculture assisted by a Deputy Director and three Assistant Directors who are directly responsible for the three main functional sections of (1) Research, (2) Veterinary and Animal Husbandry, and (3) Extension and Field Services. In addition, the following major divisions report separately to the Directorate:-

Marketing Division (recently transferred
to the Ministry of
Trade and Industry)

Botanical Gardens
Fisheries Division
Meteorological Division
Agricultural Economics Division.

The work of these sections and divisions of the Department is described in the ensuing pages of this report. A list of staff is given in the Appendix. Table XIII sets out the Organisational Chart of the Department.

Close contact was maintained with Government Departments and with Statutory Organisations concerned with Agriculture and Fisheries. The Director of Agriculture is Chairman of the Sugar Experiment Station (which is financed by the Sugar Producers' Association) and Chairman of the Sugar Industry Rehabilitation and Price Stabilisation Funds Committee. He served as Chairman and later as a Director of the Rice Development Company, as a member of the Rice Marketing Board, a member of the Council of the Rice Producers' Association, Chairman of the Fishery Advisory Committee and is a member of the Industrial Committee of the Royal

TABLE XIII

ORGANISATIONAL CHART

DEPARTMENT OF AGRICULTURE - BRITISH GUIANA.

DIRECTOR

DEPUTY DIRECTOR

CLERICAL STAFF -	Executive Officer	BOFANTIC GARDENS
	Accountant	ECONOMICS DIVISION(SECTION (a) Production; SECTION (b) Marketing
	Central Accounting Staff	MARKETING DIVISION (Fish Market; Processing Factory; Bacon and Ham Factory; Produce
	District Accounting Staff	Depots; Pasteurisation Plant).
		ANIMAL & PLANT PROTECTION SERVICE
		AGRICULTURAL OFFICER (Land Settlement & Development)
		EBENT LIVESTOCK STATION //
		ST. IGNATIUS LIVESTOCK STATION //
		FISHERIES DIVISION (Marine, Inland & Research)

AGRICULTURAL OFFICER	ASSISTANT DIRECTOR (Extension)	ASSISTANT DIRECTOR (Research)	ASSISTANT DIRECTOR (Veterinary & Animal Husbandry)
	DISTRICT STAFF AGRIC. ENGINEER	A.C. (Perennial Crops)	(Veterinary Officer
	AGRICULTURAL OFFICERS (11)	A.O. (Annual Crops)	(Research) (1)
FARM YOUTH TRAINING	AGRICULTURAL ASSISTANTS (5)	A.C. (Rice)	Veterinary Officers
	FIELD ASSISTANTS (39)	A.O. (Fibre & Pasture)	(General) (4)
INFORMATION & EDUCATION	(District Demonstration Stations & Nurseries)	Plant Pathologist	Livestock Officer
		Entomologist	
		Entomologist (Rice Storage Investigations)	
		Agricultural Chemists (3)	
		Soil Surveyors (2)	
		Soil Scientist (1)	
		Agronomists (Soil Surveys) (2)	
		CENTRAL AGRICULTURAL STATION //	

N.B.:- // Advisory Marketing Committee with D. of A. as Chairman
 -// There is an Administrative Committee comprising
 D.D. of A. Chairman, A.D.(V) & A.D.(R).

Agricultural and Commercial Society and of the National Council on Nutrition.

Funds voted to the Department by the Legislative Council in 1960 were \$1,962,068 on the Recurrent Estimates and \$1,426,120 on the Development Estimates.

Staffing

(i) Professional

There was little improvement in the staffing situation. The number of vacancies among senior professional officers at year end amounted to 40% of the total establishment as follows:-

	<u>Vacancies</u>	<u>Establishment</u>
Chemist	1	3
Agricultural Economist	1	1
Soil Surveyor	1	1
Plant Pathologist	1	1
Veterinary Officers	2	5
Agricultural Officer (Animal Husbandry)	1	1
Agricultural Engineer	1	1
Agricultural Officers (Research & Laboratory)	3	3
Agricultural Officers (Field & Extension)	2	12
Agricultural Assistants	-	5
	<u>13</u>	<u>33</u>

There was much uneasiness among the staff with respect to the unfavourable comparison of their salaries with those of their colleagues in neighbouring territories and in local industry and commerce. This situation was aggravated by the greatly increased work load imposed by the Agricultural Development Programme and by the shortage of staff. At the time of writing, a Salaries Commission was investigating salaries and conditions of service for all Government officers and employees; this has given some hope of better days to come among these cadres.

(ii) Technical

The supply of Junior Staff was well maintained. The training programme at the Eastern Caribbean Farm Institute has served to ensure a regular flow of such staff, particularly to the Extension Division. The number of vacancies for such staff at year end was negligible - ~~four~~ in a total establishment of 67.

	<u>Vacancies</u>	<u>Establishment</u>
Senior Field Assistants	-	2 Research & Laboratory 1 Field & Extension
Grade I Field Assistants	1 Research & Labs.	11 Field & Extension 9 Research & Labs.
Grade II Field Assistants	1 Research & Labs. 2 Field & Extension	27 Field & Extension 17 Research & Labs.

Training

The number of Government sponsored officers in training, on scholarships, with the object of taking up appointments in the Department were:-

At Universities - As Agricultural Officers - 5

As Agricultural Economist - 1

At the Eastern Caribbean Farm Institute

As Field Assistants - 15

Government decided to terminate the scholarship scheme but to grant loans to enable students to qualify in the professions. The wisdom of this measure remains to be seen

The following numbers of officers pursued special training during their vacation leave:-

United Kingdom - 1

United States (sponsored by the International Cooperation Administration of the United States of America) - 5

Four officers returned to the colony, after having completed training courses in agriculture at the University of Puerto Rico, under a grant provided by the International Co-operation Administration.

Technical Assistance

(i) United Kingdom

The Department continued to receive technical aid and advice from the offices of the Agricultural Adviser, the Animal Health Adviser and the Fisheries Adviser to the Secretary of State for the Colonies.

The Director had discussions during the year with Sir Geoffrey Nye, Agricultural Adviser. Sir Geoffrey participated at the meeting of the Official Standing Committee on Agriculture held in Antigua which was attended also by the Director of Agriculture.

Mr. D. Rhind, Secretary of the Committee for Colonial Agricultural, Animal Health and Forestry Research, visited the Colony to observe the work of the Department in relation to schemes supported by Colonial Development and Welfare Funds. These schemes are:-

Cocoa Development (D 4457)
St. Ignatius Livestock Station (D 4332)
Soil Surveys (R 892 and D 3286)
Fisheries (D 2555 A)
Training Centre, Mon Repos
Central Agricultural Station (D 1931 & A)
Agricultural Laboratories, Central Agricultural Station (D 4247/R1152)
Hosororo Experiment Station (D2319 & A)
Produce Depot.

Several Institutes and Bureaux in the United Kingdom maintained by Her Majesty's Government to help commonwealth territories, were of great help to the Department. The Tropical Products Institute gave special help with several matters, including the preparation of ins coffee and the production of coir.

Mr. Hawkins of the National Institute of Agricultural Engineering visited the colony and submitted a valuable report on farm mechanisation and related matters.

(ii) Federation of the West Indies

There was close consultation with the Federal Agricultural Adviser, whose services are also available to British Guiana. Mr. A.F. McKenzie, C.M.G. - the Federal Agricultural Adviser - takes a keen and constant interest in our work and problems. He gave special service to Government in enquiring into the price formula under which farmers supply sugar cane to factories and made recommendations for a new formula.

British Guiana is associated with a number of regional organisations such as the University College of the West Indies' Faculty of Agriculture - the Imperial College of Tropical Agriculture, the Eastern Caribbean Farm Institute and the Regional Research Centre.

Regional commodity trade agreements continued for rice and oils and fats. The sugar producers of the colony worked as usual closely with those of the West Indies in price negotiations for sugar under the Commonwealth Sugar Agreement.

Collaboration in agricultural planning and in research is ensured through the Regional Natural Resources Council and its Committees on which the colony is represented. Meetings of these bodies were held during the year.

(iii) United Nations Organisations

Negotiations were finalised for a detailed soil survey of over one million acres of coastal and riverain soils and for reconnaissance and generalised soil surveys of the rest of the country. Under this Scheme, the United Nations Special Fund will provide \$833,680 as a free grant and the colony - largely from Colonial Development and Welfare Funds (U.K.) - the sum of \$750,720. Professional staff will be supplied by the United Nations and provision has been made for fellowships for the training of local personnel. The soil survey is already in progress.

The Department is kept well informed of developments in a number of technical fields through publications from and by contact with the Food and Agriculture Organisation.

(iv) United States of America

Appreciable help was obtained from the International Cooperation Administration (I.C.A.) of the United States of America. The following experts from this Organisation were attached to the Department:-

Mr. M.E. Knickerbocker	- Livestock Specialist
Mr. D.H. Lee	- Marketing Specialist
Mr. J. Wheat	- Horticultural Specialist
Mr. R.B. Gregg	- Rural Credit Specialist
Mr. A.C. Hale	- Vocational Agriculture Specialist (also assigned as Crop Specialist)
Mr. D. Carter	- Rural Youth Specialist
Mr. Madamba	- Crop Specialist (six months)
Dr. Adams	- Vocational Agriculture Specialist (six months)
Mr. C. Kauffman	- Fisheries Specialist.

Some of the contributions made by this team included

- (1) Setting up of a demonstration dairy farm at Garden of Eden Land Settlement.
- (2) Advice on the development of the pig industry.
- (3) Initiation of a clean milk campaign.
- (4) Organisation of fruit marketing.
- (5) Establishment of model cacao fermentary and drier.
- (6) Introduction of new crop species and improved varieties.
- (7) Organising a supervised credit scheme for land settlements.
- (8) Promotion of 4-H and Young Farmers' Clubs.
- (9) Technical training courses for staff and others.
- (10) Reorganisation of the Wholesale Fish Market.
- (11) Improvement of refrigeration facilities.
- (12) Advice of boat design and fishing techniques.
- (13) Preparatory work on the establishment of a Farm Sch

I.C.A. arranged a number of training courses in the United States for members of the staff of the Department, secured literature and information on technical matters, and obtained seed and planting material.

A Seminar on extension methods was organised for the Field Staff and for selected members of the staff of other Departments and the Rice Producers' Association. I.C.A. supplied four lecturers.

The services rendered by the I.C.A. are of considerable value to the country and are hereby acknowledged with appreciation.

Conferences and Meetings held in other Territories

The Department was represented at the following Conferences and Meetings held in other countries:-

1. National Resources Council held in Trinidad.
2. Official Standing Committee for Agriculture, Animal Health, Forestry and Fisheries held in Antigua.
3. Veterinary sub-Committee of the Official Standing Committee held in Trinidad.
4. Conference for negotiation of prices and supplies of rice from British Guiana to the West Indies held in Trinidad.
5. F.A.O. Grasslands Conference for Latin America held in Venezuela.
6. Foot and Mouth disease Conference held in Colombia.
7. Meeting of Board of Governors of the Eastern Caribbean Farm Institute in Trinidad.

8. Fisheries Committee meetings in Virgin Islands.
9. International Soil Congress held in the United States of America.
10. F.A.O. meeting on soils of Latin America held in the United States of America.

Officers visited Brazil, Suriname and Trinidad on technical missions.

General

The Department worked in close consultation with all local agencies and Government Departments concerned with the development of agriculture and fisheries. An Agricultural Officer performed liaison duties with the Land Development Department; and another was similarly concerned with respect to the International Cooperation Administration. Departmental representatives served on committees to select settlers for Land Development projects on Rice Assessment Committees, Regional Development Committees, Drainage and Irrigation Committees and the Sugar Cane Price Fixing Committee.

Close cooperation was maintained by the Directorate with the Credit Corporation, Statutory Boards and Producers' organisations. Relations with the Press were satisfactory.

Meetings were held between the Administration and the Departmental Staff Association and the Government Employees' Union to examine issues affecting the staff and departmental employees.

RESEARCH AND EXPERIMENTATION

Organisation of the Research Service

The Research Division consists of the Assistant Director (Research) whose function is to co-ordinate the work of a team of specialist officers consisting of an Economic Botanist, two Entomologists, a Plant Pathologist, three Agricultural Chemists, one Soil Scientist, two Soil Surveyors, three Agricultural Officers who deal with (a) Annual Crops (b) Perennial Crops and (c) Grassland and Fibre Crops. With the exception of the Chemistry Division, Specialist Officers of the various Divisions have temporary laboratories at the Central Agricultural Station where they are provided with quarters so as to be within easy access to their laboratories and field experiments. Funds have been provided for the new Agricultural Research Laboratory at the Central Agricultural Station and the erection of the building has commenced.

In addition to the Central Agricultural Station which serves as the main centre of research, there are four other Stations of the Department primarily engaged in research work on the crops of the areas and at the same time the officers stationed carry out advisory work among the farmers. The Mosororo Agricultural Station in the North West District deals with the main crops of the area such as citrus, cacao, coffee, maize and root crops generally and in addition with the fertility problems associated with the deep pegasse (peat) soils. The Ebini Livestock Station on the right bank of the Berbice River and about seventy miles inland is situated on an area of poor sandy soils representative of the district. This Station is investigating the possibilities and economics of beef production under the conditions of low soil fertility and extremely poor natural pastures. The St. Ignatius

Livestock Station in the interior Rupununi savannas is also engaged with the problems of livestock production, animal health, pastures and breeding for the beef trade in the area. The Cacao Research Station at Atkinson on the right bank of the Demerara River and about 25 miles from Georgetown deals primarily with the introduction and trial of cacao clones in addition to plant propagation. Nurseries for citrus, including limes are established at the Station as well.

There is a Central Research Committee with the Director of Agriculture as Chairman, the Deputy, three Assistant Directors and the Sugar Agronomist as members. This Committee approves the general programme of Research to be pursued in the Department in relation to the policy of Government. In addition, there is the Rice Research Committee with the Assistant Director (Research) as Chairman, and other specialist officers as members. This Committee discusses the technical problems related to the rice industry and submits programmes of investigations to the Central Research Committee for approval. There is also the Sugar Research Committee consisting of the Director of Agriculture as Chairman and research officers of the Department and allied organisations review the progress on sugar research undertaken by Companies the Sugar Producers' Association and Departmental organisations. There is a Livestock Committee with the Director of Agriculture as Chairman and specialist officers of the Department, including Scientists of the International Cooperation Administration of the United States as members. This Committee studies and approves the programme of work relating to the Livestock Industry in the Country.

Other Research Organisations

The Sugar Experiment Station which is maintained by the Sugar Producers' Association serves the sugar industry and is engaged primarily in varietal, fertilizer and cultivation investigations. Bokers Sugar Estates Ltd., maintained a well-equipped research laboratory and a team of technical staff that investigate in greater detail the problems of sugar cane cultivation on their plantations. In addition, other plantations carry out limited research for their cultivation and processing of sugar and its by-products.

The British Guiana Rice Development Company Ltd., continued to work on problems in connection with all aspects of the mechanisation of rice cultivation. The Company operates two Central Rice Mills and cultivates about 3000 acres in rice. However, the Department of Agriculture has assumed responsibility for experimental work on 100 acres of land in this area.

Sugar Cane

The work described for this crop was done by the Sugar Industry, with the exception of resistance ratings for Leaf Scald disease which were carried out by the Plant Pathology Division of the Department of Agriculture.

Variety Testing

Variety testing of seedlings continued to be the main line of investigation and is the responsibility of the Sugar Experiment Station which works closely with the sugar estates' technical divisions. All estates have reported increases in the proportion of B 41227, partly at the expense of B 37161, but chiefly at the expense of varieties such as B 4362, B 47258 and B 47225 which are quite definitely on the way out.

Of the newer varieties which are in an advanced stage of testing, D 141/46 has given consistently good results and averaged about 4.3 tons of sugar per acre. Another variety that has done well in trials is B 50135 which gave approximately .69 tons and 5.40 tons of sugar per acre on two plantations. Two other varieties B 51116 and B 51131 are sufficiently near to commercial status to make extensive trials desirable.

The work on variety testing - particularly on screening tests of more recent varieties has been greatly stepped up at regular centres from whence any promising varieties are disseminated to estates in the area.

All the promising Demerara varieties, all the Barbados varieties up to B 55 series and the D.B. varieties up to the 955 series totalling 40 varieties are being bulked up for variety trials so that any promising varieties will be "drawn out of the wash" at an early date and will be available for commercial cultivation if their performance merits it.

The good performance of Demerara (D) varieties is encouraging. The quality of the varieties D 158/41 and 141/46 was better than the standard canes at Rose Hall, Corentyne, and the highest tonnage of sugar per acre was obtained from the variety D 37/45 at Enmore. It is believed that ability to stay erect gives a great advantage of quality of cane under conditions in British Guiana; however, the disadvantages of the D. varieties are that they are all heavy growers and so their cultivation is confined to the Autumn crop and in addition they generally have high fibre content.

At the Sugar Experiment Station some 35,000 seedlings are now planted out annually, mostly from fuzz produced in Barbados, but partly also from crosses of varieties only available in British Guiana: this is in addition to the annual screening of the 200 - 250 selections which have received "B" numbers. It is felt that this emphasis on selecting canes for British Guiana conditions should enable the varietal prospects to improve in the future.

Cultivation Practices

Investigations on the various methods of cultivation which have been used in British Guiana over the last 10 years have been continued and although some of the individual experiments were not all that might be desired, the accumulated data are adequate to reach firm conclusions.

Mechanical cultivations when carried out well may bring about increased in yield of up to 10% in plant cane, there is little or no residual effects after the first year. The influence of "mother earth" in subsequent years completely overshadows the original cultivation operations. Nature works in two directions - it also, fortunately, brings up the condition of soils the tilth of which may have been temporarily unfavourably affected by cultivation under too wet or too dry conditions.

Residual effects in 1st ratoons from cultivation trials at Pln. Ogle showed none of the cultivation treatments to have a significant residual effect in 1st ratoons: the only significant effect was that of carbide sludge which was used in combination with cultivation treatments.

Trials were carried out to test the effects of cultivation operations before and after flood-fallowing. Highly significant increases in yield were obtained in the treatment cultivation before flood-fallowing as compared with

cultivation after flood-fallowing. In previous trials no great differences have resulted between the two practices. There was some evidence of a beneficial effect of sub-soil when carried out before flood-fallowing, but not when carried out after flood-fallowing, the magnitude of the effect was the same order as that previously found $1\frac{1}{2}$ - 3 tons cane/acre.

Inter-row cultivation of ratoons has, in general, given no response other than a small response to the earthing up operation practised at Houston Estate.

Apparently the top-soil which is normally the only horizon affected by cultivation is kept in reasonably good tilth by root development. It is in the horizon from say 12" to 36" where anaerobic conditions often exist that the chief limiting factors are to be found and the cultivation practices in use at present do not impinge on the conditions in this part of the horizon. However, there are limited areas of silty clays where surface composition seems to occur and it should be profitable to try out various inter-row cultivation practices on these selected soils. Trials with mole drains are being carried out in order to bring about improved conditions of the sub-soil.

Irrigation Trials

Some further trials using flood irrigation at varying deficits with control plots unirrigated were harvested during the year. In general, little beneficial effect was obtained from flood-irrigation, however, in most cases rational rainfall was reasonably adequate. The saline frontlands of the East Coast Demerara were exceptions to this conclusion and good responses were obtained, irrigation at $2\frac{1}{2}$ " deficit being optimal. Further trials with flood irrigation will be restricted. Investigations will continue using an overhead sprinkler irrigation system.

The Wright Rain irrigation indicator is also being tested against actual evapotranspiration in association with growth investigations and the value of tensiometers and nylon electrical resistance units is being investigated.

Mineral Nutrition and Fertilizer Investigations

The changes in fertilizer requirements which follow from a progressive fertilizer policy is being evaluated each year with a large number of factorial trials. During the subnormal rainfall period which has continued into 1960, little response to additional fertilizer over the basic level has, in general, been obtained except at two plantations under irrigated conditions. There is good evidence that savings on nitrogen dressings may be made so long as the present weather relations persist. It has therefore been decided to reduce the basic dressings and to use aerial application for any supplements that leaf analyses may prove necessary. Fertilizer investigations have been concerned with the economics of different fertilizer materials.

The trials on urea versus sulphate of ammonia were completed and showed that urea was inferior at equal nitrogen levels in the vast majority of cases by approximately $1\frac{1}{2}$ tons cane/acre. Levels of sulphate of ammonia and urea were factorially combined with time of applications. There were no significant differences between time of application up to 3 months after planting or harvest.

Pests and Diseases

Damage of canes by rats was substantially controlled in 1960. The two pelletising machines have worked at full

capacity for over a year making anticoagulant and endrin pellets. Biological dissections of rats at intervals have been continued and the data submitted to the Rodentologist of the Colonial Office.

The year 1960 was characterised by heavy increase in borer damage, particularly the giant borer Castnia licus which multiplied and spread to an alarming extent. Other borer damage was also considerably higher. Spraying at planting time with "acodel" - an oil-based B.H.C. product had been effective. This appeared to be the most effective insecticide but trials with Agroxide 26 meltable powder are in progress.

Outbreaks of caterpillars and aphids occurred sporadically on most estates and there were localised frog-hopper attacks at some plantations. These and other minor insect pests were controlled without difficulty.

The cane was extraordinarily free from sugar cane diseases during 1960 - there was little or no leaf scald to be seen even in susceptible varieties and inoculation to test for resistance in new varieties was largely ineffective. It would seem that the leaf scald organism has now become so alternated that it is of no practical significance. Chlorotic Streak and Pokkah Boeng were only rarely seen.

Weed Control

Extensive trials were carried out with new herbicides, Simazin, Atrazine, Fenac and C.P. 13842. Simazin in particular gave good weed control at 3 - 4 lb. per acre of broad-leaved weeds and of the troublesome coryla vine. None of these herbicides controlled gramineous species. Fenac and C.P. 13842 have not yet been fully evaluated. Dalapon was effective in controlling June grass (Inperata spp.) and paragrass (Brachiaria sp.). It was necessary to irrigate the grass weeds first before applying the dalapon, for effective control.

The use of manatees for clearing canals was evaluated at Port Mourant where seven animals were operating for a year. They successfully controlled the main weeds, shrimp grass, water hyacinth and to some degree cabomba. The herd cleaned a cross canal 15 ft. wide and 80 rods long (1,000 ft.) in five days. The main difficulties are concerned with the containment of the manatees in the desired canals and with the movement of the herd. The cost of handling the animals on sugar estate canals is prohibitive and they are less effective in shallow canals and do not like to be disturbed.

T.C.A. or Dalapon, in combination with 2.4 - D is effective in killing off canal weeds after draining dry and subsequent admittance of water prevents regrowth.

Rice

Introduction, Breeding and Genetics

The rice breeding programme continued at the Central Agricultural Station for the Spring and Autumn Crops. The aim of the programme is to produce a variety with the following characteristics:-

- (a) Be at least equal in yield to that of the standard variety No. 79;
- (b) Be non-lodging;
- (c) Be non-shattering;
- (d) Possessing a medium-long grain type and must cook without becoming sticky;

- (e) Be vigorous, adapted to all the main soil types and resistant to Piricularia and Helminthosporium;
- (f) Maturing at suitable times both for the Autumn and Spring harvests;
- (g) Be high yielding with minimum amount of fertilizer

New Rice Varieties in Farmers' Trials

During the Autumn crop of 1960, four new varieties were tested in ten experiments on farmers' holdings along the coastlands on Frontland clay and on Percussy clay. The varieties were B.G. 6047, B.G. 6036, B.G. 6044 and B.G. 60260. These varieties are non-lodging and less photosensitive than the standard variety No. 79. They cooked well and their yields exceeded that of No. 79 by 5 - 20 per cent. B.G. 6047 and B.G. 6044 are especially suited to Percussy clay and they have shown relatively good resistance to Blast disease (Piricularia oryzae Cav.) at Land of Canaan on the East Bank of the Demerara River and at Potasi on the West Bank of the Demerara River. In these areas on the banks of the rivers, Blast is a very common disease which affects the rice plant so new varieties are usually tried in these areas to test their resistance.

It has been found that the varieties gave about 10% higher yield per acre when broadcast at about 80 lb. per acre than when they were transplanted at a spacing of 9" x unless the transplanted field is fertilized with 1 cwt. of triple superphosphate and 1½ cwt. of sulphate of ammonia, per acre, when the yields of the transplanted and the broadcast plots tended to be equal.

Eight other promising varieties which have not been tested as widely have given promising results of high yields in the order of 24 - 40% in excess of the standard variety No. 79. They are B.G. 6041, 6050, 6052, 6064, 6006, 60138, 60113 and 60110.

Imported Rice Varieties

The variety Sigadis imported through the good office of F.A.O. grew well, but lodged at the time of maturing. Varieties shown below were imported as being resistant to Blast but when grown at Land of Canaan on the East Bank of the Demerara River proved to be susceptible.

Varieties which proved susceptible to Blast

1 Anak Ikan Rendah	14 Morak Sepilai
2 Anak Ikan China 36	15 Achah Puteh
3 Radin Kuning	16 M.O.1
4 Mayang Ebas 88	17 Jhona 349
5 Chantex Puteh	18 Darva Sannam MTU 15
6 Serendah Puteh	19 Anak Ikan Sombong
7 T23	20 Radin Siak 34
8 SR 26b Kalam bank	21 Mayang Sagumpal
9 Rupsail 859 CRH13	22 Acheh
10 Anak Ikan Gerising	23 Reyong 20
11 Anak Naga	24 Kumragone CRH19
12 Radin Che Mah	25 Chengal pet Sirumani
13 Jintan Puteh	26 Patnai 23 CRH7
	27 Tella Sannavadhu CO2

The varieties listed below were imported as being salt resistant but when grown on the Frontland clay at the Central Agricultural Station proved susceptible to salt damage by one flooding with brackish water.

Varieties which proved to be susceptible to salt

P.T.B. 10	B.J. 1	COL3
CH 55	H-755	CP6
CP 9	S.M. 6	S.M. 8
S.M. 9	S 67	S 624
MTV 5	A.K.P. 8	A.K.P. 9

From the experimental data there appears to be some evidence that a few of the new varieties show more tolerance to salt than the standard No. 79, since they show less withering of leaf tips in the same field.

Programme of Back Crossing

Back crossing of suitable hybrids is proceeding with a view to producing non-lodging types which will otherwise be similar to local varieties. A population of about 30,000 F 1st back cross plants, is about to undergo selection with a view to obtaining hybrids for a second back cross.

Weed Control in Rice Fields

Eight experiments were carried out on the chemical control of weeds in rice fields. The results may be summarised as follows:-

(a) Proponex (2 - methyl 4-chlorophenoxy propionic acid) when applied at the rate of one to three parts per acre was not effective in controlling sphenoclea zeylanica and Finbristylis miliacea growing in rice 5 to 6 weeks old.

(b) It was found that 2, 4, 5-T was less injurious to young rice three weeks old than 2,4-D. Injury consisted of spreading of the young plants, severe scorching or death.

(c) Fernamine when applied at 2 to 2½ pints per acre in 20 gallons of water controlled the main weed of rice more effectively than 1½ pints per acre of 2,4-D or 2,4,5-T, with no visible injury to the rice plant. The main weeds controlled were Sphenoclea zeylanica, Finbristylis miliacea, hopetocarpus guyanensis, Jussiaena erecta, Thalia geniculata, Eliocharis caribba, Eliocharis mutata, Cyperus articulatus and Aeschynomena sensitiva.

(d) It was shown that 2,4-D, 2,4,5-T, Fernamine and Weedone at 1½ pints per acre defoliated the shrubs Cordia sublettia and Cassia alata. However, the plants recovered within three weeks due to sprouting of auxillary buds.

The cultural method is the most common control used by farmers. It consists of sowing seed at 80 - 90 lb. per acre on suitably prepared land to ensure a good stand in order to avoid competition of weeds. In this way seeds are effectively suppressed.

Control of "Drop-seed"

Reglone when applied on drop seed at the age of 6 weeks desiccated the plants, but they recovered within 2 - 3 weeks.

The control of drop seed by wet-smearing dry cultivated land has been demonstrated to farmers to be very effective. Seed of high purity has been produced by broad-casting germinated seed on land prepared in this manner.

Fertiliser Investigations on Rice

The Department of Agriculture has recommended a 10:20 NP mixture at the rate of 1 cwt. per acre applied at the time of planting or seeding. A number of field trials were carried out to determine whether the present recommendations need any revision and to what extent. The results have further confirmed those of previous experiments that on the comparatively unproductive soils which are high in exchange aluminium and sulphuric acid, phosphate in the presence of nitrogen in the form of a 10:20 mixture has given significant responses in yield of grain of the order of 700 - 800 lb. per acre over the untreated plots which averaged 1,715 lb. of paddy per acre. There was no significant responses indicated from potassium.

Further trials were carried out at Mara and Vergentegen Land Settlements, at Central Agricultural Station and at Essequibo, on clay and pegassy clay soils. Urea was included as a treatment and it was applied 50 days after planting or broadcasting except at the Central Agricultural Station where equal split applications were made at 10 and 50 days after broadcasting. At Mara and Essequibo the rice was transplanted while the others were broadcast. The results are shown in the attached table.

At the Central Agricultural Station and at Mara the results indicated no increase yield from the fertiliser applied but at Vergentegen and Essequibo, and particularly on the pegassy clay at the former site, increases in yield from fertilisers were substantial. The application of urea showed slight increases at Essequibo on the clay soils.

The results of several long term fertiliser trials extending from three to eight years at the Mahaicony/Abary Rice Development Scheme when statistically examined, indicated that over a period of years, the application of lime had significantly increased to pH of the soil from 5. to 5.8. It was found that in the majority of experiments there were small but consistent responses in yield of grain to applications of nitrogen, phosphate and lime. Further results from trials conducted in 1960 showed that there was a highly significant response to limestone when applied at the rate of 2 tons per acre. Applications of 8 cwt. and 16 cwt. of limestone per acre used - previous experiments are considered too low. Phosphate in the presence of nitrogen was also significant at one per cent level. The soil type was pegassy clay. There was no significant response from applications of potassium. The mean yield of paddy from the experiments was 2973 lb/acre.

Further demonstration trials on farmers' holdings were carried out, the results of which did not confirm that a change in the present recommendations of the Department was necessary. However, on pegassy clay it is recommended that a basic application of one ton of limestone per acre should be made once in two or three years. On the Frontland clay soils indications were that the present recommendation of 1 cwt./acre of a 10:20 mixture applied at planting should be supplemented by a top dressing of half of one hundred weight/acre of sulphate of ammonia about 4-5 weeks before flowering.

At equivalent levels of nitrogen, urea appears to be less effective than sulphate of ammonia. However, on soils high in sulphate radical urea is being further tried out.

Foliar Analysis

Analysis of leaves of particular species of plants growing naturally on the tonic pegasse soils, that is, soils high in exchangeable aluminium and sulphuric acid was made for their contents of aluminium. The following table records some of the value obtained.

<u>Plant Species</u>	<u>AL</u> <u>ppm</u>	<u>P₂O₅</u> <u>ppm</u>
1. Wild Starch <u>Thalia geniculata</u>	635	2060
2. Moko-Moko <u>Montrichardia arborescens</u>	7407	2426
3. Miconia spp.	7037	2289
4. Aete palm <u>Mauritia flexuosa</u>	243	2220
5. Manicola palm <u>Euterpe edulis</u>	206	824
6. Bisi-Bisi <u>Eliocharis interstincta</u>	85	664

Moko-Moko and Miconia spp. accumulated considerable amounts of aluminium.

A further trial was conducted on Frontland clay with low aluminium content and the pegasse soils of high aluminium with crops of maize and cow-pea. After two months of growth the plants were harvested and the stems, leaves and roots were analysed for aluminium and phosphate. The results are shown in the table attached.

Maize and cow-pea grown on the Frontland clay showed comparatively small amounts of aluminium in the leaves and particularly in the roots than when grown on pegassy clay. Cow-pea is more tolerant to the arable aluminium in the pegassy clays. There are larger areas of tonic organic soils in the Boerasirie and the problem of finding suitable economic crops other than grass is being intensively investigated.

Red Rice Control

A survey was carried out by the Extension Staff of this Department in the main rice producing areas in order to assess the incidence of red rice. The figures disclosed that in areas where dry cultivation has been practised using agricultural machines, the incidence of red rice had reached the enormous figure of up to 90% recorded in the Mahaica-Mahaicony area. In areas where wet cultivation was practised and particularly with transplanted rice, red rice was below two per cent on the West Coast of Demerara and the Essequibo Islands.

Close observations and experimental work at the Mahaicony/Abary Rice Development Scheme have indicated the value of wet cultivation as a suppressor of red rice. The incidence for the wet cultivated areas of the Scheme over the past six years was less than 10 per cent compared with over 35 per cent for all other forms of dry cultivation. Eight wet cultivated fields with adequate control of water had a red rice index of less than one per cent, compared with an index of slightly less than 15 per cent from wet cultivation where water control was not satisfactory. These results further emphasise the need for efficient control of water in the rice industry. The large drainage and irrigation schemes commenced by Government will assist considerably in keeping down this menace to the industry. Deep ploughing has also given some reduction in the incidence of red rice but unless there is adequate inversion of the soil, this method does not give satisfactory control. The grazing of cattle on rice fields after harvest has also been practised by farmers with some success.

TABLE XIV
YIELDS (140 lb. bags/acre) FERTILIZER TRIALS ON RICE

(Autumn Crop 1960)

	TREATMENTS IN LBS./ACRE	MARA	C.A.S.	VERGEM NGEM		ESSEQUIBO (Clay)	
				Clay	Pegassy Clay	Anna Regina	Alliance
A	30 lb. N as S of A + 30 lb. P ₂ O ₅ as TSP	13	20	14	24	28	30
B	1 cwt. 10:20 + 1 cwt. S of A + 10 lb. P ₂ O ₅ as TSP	16	14	18	26	30	37
C	30 lb. N as Urea + 30 lb. P ₂ O ₅ as TSP	14	19	19	21	31	40
D	1 cwt. 10:20 + $\frac{1}{2}$ cwt. Urea + 10 lb. P ₂ O ₅ as TSP	16	12	21	22	29	37
E	2 cwt 15:15 + 15	9	20	16	15	33	33
F	1 cwt. 10:20	10	19	17	29	27	30
G	No treatment	16	21	14	17	28	29
H	1 cwt Urea	14	11	19	14	32	33
TOTAL		118	136	138	168	230	269
AVERAGE		14.5	17	17	21	30	34
VARIETY		D.110	No. 79	D. 110	No. 79	D. 110	D.110

NOTES:

(1) Urea was applied 50 days after planting or broadcasting wherever included in treatment, except at C.A.S. where the applications of Urea in treatments C and H were split into 2 viz. 10 and 50 days after broadcasting.

During 1960, demonstrations were carried out on farmers' holdings where the incidence of red rice was high, a simple method of control developed at the Central Agricultural Station. This consisted of wet-smearing dry cultivated land and the subsequent retention of the water in the field for a few days enabled practically complete suppression of red rice. There was little red rice in the paddy sown.

For 1961 the Rice Marketing Board will pay a bonus on paddy with a minimum amount of red rice. Red rice reduces yield and pure line seed degenerates rapidly with its presence.

At the Central Agricultural Station and at Micony/Abary Rice Development Scheme it was shown that D when applied before germination takes place at rates other than four pounds per acre, reduces the stand of red rice considerably. Recently, the Herbicide Agronomist of the Imperial College of Tropical Agriculture, working with red rice samples from British Guiana, has shown that the weedicide Eptam under specific conditions, effected considerable control on the germination of red rice. This investigation is being continued and arrangements are being made to carry out this method of control on a full scale in 1961 in this country.

Control of Pests and Diseases

Outbreaks of Rice Water Weevil (Lissorhoptrus simplex) occurred in the Essequibo, Corentyne and West Demerara districts considerably reduced the yield of grain from about 10,000 lbs. Preliminary investigations carried out by treating the sown paddy with Aldrin at the rate of 4 oz. of 50% meltable emulsion indicated that weevil attacks were substantially controlled. Plans are in progress for the distribution of treated seed line seed to farmers.

The incidence of Paddy Bug (Solubea poecila) increased considerably for the Autumn Crop in the Berbice and Essequibo districts. Dusting with 6.5 per cent Benzene hexachloride (Agroicide 10) using motoblos, effectively controlled this pest. This is a very common and troublesome pest of rice and the Rice Marketing Board has provided motoblos and insecticides scattered throughout the rice growing centres. The farmer pays the cost of the insecticide only, the other expenses are provided free to him. This Scheme since it was introduced in 1960, has assisted considerably in controlling this pest at an early stage.

Outbreaks of the rice caterpillar (Laphygma frugiperda) occurred in some areas for the Spring and Autumn crops but the damage done was not as serious as in 1959. Early dusting with benzene hexachloride assisted in keeping this pest under control.

Blast (Piricularia cryzae) and Leaf Spot (Helminthosporium cryzae) were the principal diseases affecting rice during the year. Blast was not as serious as in previous years but as usual occurred mostly in the riverain areas. Reasonable control was effected by spraying with Verdasan (an organo-mercuric fungicide); three applications were made before the plants flowered. Farmers have been slow in responding to the use of Verdasan. In 1959 Government at its expense sprayed 100 acres of rice at Mara but in 1960 no free-spraying was done by Government.

For the first time as a means of controlling "Leaf Spot" disease, seed paddy was treated with Agrosan GN at the rate of 5 oz. per 100 lb. and such treatment effected reasonable

control of the disease. The quality of the paddy and the yield per acre increased significantly. It is expected that in 1961 more farmers will sow treated seed. Two machines for the mixing of the seed with chemicals are on order. In the areas where the disease Blast occurred, the yield of grain per acre was considerably reduced. Spraying with Verdasan gave increases in yield varying from 800 - 1000 lb. per acre compared with a yield of 500 - 700 lb. of paddy per acre for the untreated plots and where the incidence of the disease was high.

Rice Storage Investigations

Under local conditions the most important insects attacking both paddy and rice are Calandra oryzae (1), Rhizopertha dominica (Fabr.) and Sitotroga cerealella (Oliv.) The greatest damage to paddy and rice is caused by Calandra and Rhizopertha and the financial loss could be very high.

Under the research programme, financed by Government, the Rice Marketing Board and the Rice Development Company, special attention was paid to the pests Sitotroga cerealella (Oliv.) and Rhizopertha dominica (Fabr.) which are the most important ones attacking paddy in storage. In the early months of storage Sitotroga caused the greater damage but as the paddy remained longer Rhizopertha became more important and was the principal pest responsible for damage to paddy in storage.

Field examinations continued during 1960, and it would appear that only a very small percentage of the Sitotroga infestation occurred in the field and most of the early infestation in storage was the result of the latent population of this insect present in old crop paddy and sweepings in the mill bonds. This insect breeds readily in paddy of high moisture content and this condition generally exists in freshly reaped paddy.

When the moisture in the paddy is decreased and portions of damaged grains and rice dust are available, Rhizopertha attacks the grain. After a few weeks the damage increases and in the course of two or three months may become appreciable.

Work was undertaken also on the storage bins suitable for small cultivators, and locally manufactured "Pliboard" was used in construction. In this connection supplementary heating equipment was examined, and trials were made in the construction of small inexpensive units suitable for small cultivators. These investigations are continuing.

Grasses

At the Central Agricultural Station, the grasses Pangola (Digitaria decumbens), Para (Brachiaria mutica) Coastal Bermuda (Cynodon dactylon), Locuntu (Ischaemum timorense) and Nadi Blue (Dicanthium caricosum) were tried out on Frontland clay and pegassy clay soils. Nadi Blue was highly unsatisfactory and has been abandoned. Locuntu is not naturally adapted to the Frontland clay and so does not occupy a large area. Para, Pangola and Coastal Bermuda have given satisfactory growth and under semi-drought conditions experienced in 1960 and as their overall performance has been satisfactory, they are extended to the Station. Pangola pastures amount to about 200 acres and Coastal Bermuda and Para about 100 acres, the latter occupying a smaller area than the former. Pangola grass responds well to phosphatic and nitrogenous fertilizers. An application of 500 lb. of sulphate of ammonia per acre, applied on about 5 to 6 dressings, is made per annum. Basic slag or triple super-phosphate is applied at the rate of 40 lb. P205 per acre.

Grazing trials at the Station have shown that stocking rate of more than one animal per acre per annum could make the pastures very unproductive for a considerable period. Para grass (Brachiaria mutica), indigenous to the country has been extended, as the main fodder grass, with Guinea (Panicum maximum), Elephant (Pennisetum purpureum), Guatemala (Tripsacum daniellii) and sugar cane (Saccharum officinale) as supplementary fodder particularly in the dry season. In addition, 30 introduced species have been tested and Golden Timothy (Setaria sphacelata) has shown promise. The most productive legumes are Kudzu (Pueraria phaseoloides), Centrosema (Centrosema pubescens), Bengal Bean (Stizolobium aterrimum) and Cowpea (Vigna sinensis). Stylo (Styloanthus gracilis) is the most promising of 14 introduced species so far tested.

In the North West District on the worn-out deep peat (peat) soils which no longer would support root crops Para grass (Brachiaria mutica) and Locust grass (Ischaemum timorense) have continued to give excellent yield of herbage with normal fertilizer application of nitrogen and phosphate. There is every indication that the rearing of cattle on the riverain lands can be based on these two grasses. The policy of the Government is to encourage the expansion of the dairy and beef industry.

Herbarium

The Jenman Herbarium was maintained and specimens were kept in order. During the year 940 specimens were identified for departmental officers and other interested organisations. In addition, 1094 specimens collected mainly by Mr. S.F. Harrison of Kew Gardens who carried out a Botanical Survey in certain parts of the country, were prepared and mounted with a view to incorporation in the botanical cabinet as replicates.

Of the 2,700 specimens which were donated to Kew, 1,000 were returned as they were replicates of some of these which were retained at Kew.

The investigation on the cause of cirrhosis of liver of animals on the Intermediate Savannahs of the Berbice River are continuing on the basis of plant poisoning. Three species of Crotalaria (C. maypurensis), (C. retusa) and (C. stipularis) were found at Waranama. Liver biopsies are being examined at the University College of the West Indies. Very little progress has so far been made in solving this problem of cirrhosis.

Land Use Planning and Soil Survey

The development of the Black Bush Polder (formerly Blocks I and II) on the Corentyne Coast made excellent progress. During the year 156 settlers were selected and the first crop of rice was reaped in the Autumn. The yields of grain were satisfactory and in 1961 it is expected that selection of sites will be complete with a further 1000 farmers on the land. The area made available for agricultural expansion is approximately 30,000 acres and the soils are very fertile. Each settler is allocated 15 acres for rice and 2½ acres for his homestead, kitchen garden, coconuts and fruit trees. Government gave considerable assistance to the settlers by clearing the land and providing credit facilities for the purchase of pure line seed paddy through the Department of Agriculture.

The completion of the Drainage and Irrigation work for the Western Section of the Boerasirie Development Scheme at considerable cost on the West Coast of Demerara, has made

available approximately 30,000 acres of new land for agricultural expansion. The distribution of this land to farmers has not made much progress because of the unproductive soils present in the greater part of the area. The soils contain high amounts of exchangeable aluminium and sulphuric acid and are peaty in character. The depths of peassage (peat) mapped have ranged from 2 to 12 feet. During 1960, one hundred and twenty six settlers were selected but only 80 showed interest in the land and formed themselves into a cooperative of 25 acres for each holding. Unfortunately, they have not been able to make progress in the clearing of the land as this is an expensive operation and credit facilities were not available to the settlers. Dairy farming will be the main pursuit of most of the settlers.

At Garden of Eden, on the East Bank of the Demerara River, 132 selected settlers have taken up 1000 acres of land provided by Government on leasehold. Clearing of the land has progressed slowly on account of inadequate credit facilities. On the peassage soils (peat) 70 settlers with a holding of approximately 25 acres each, will be engaged in dairy farming and suitable vegetable crops. Fifty-four settlers with a holding of about $7\frac{1}{2}$ acres each, on the silty clay, will be engaged primarily on permanent crops such as citrus and cacao. Over $\frac{1}{3}$ of the settlers have already taken up residence at the settlement which is about 13 miles from the city of Georgetown.

The Land Development Department continued to be engaged on the rehabilitation and development of some 10,000 acres for settlements on the banks of the Berbice and Demerara Rivers, Cane Grove and Vergenoegen Land Settlements. At Mara on the East Bank of the Berbice River progress has not kept up to expectations. There are 105 settlers of whom 64 are engaged in rice and 41 on permanent crops such as lime and citrus. The size of the average holding is $17\frac{1}{2}$ acres including $2\frac{1}{2}$ acres for homesteads. The rice crop at Mara was far from satisfactory and a considerable area was left unplanted because of inadequate credit facilities provided for the purchase of seed and for land clearing and preparation.

The soil survey of the Tapacuma Project on the Essequibo Coast of approximately 30,000 acres was completed. The soils are quite fertile and rice will be the main crop. The drainage and irrigation works are in progress. The United Nations Special Fund Committee in conjunction with the local Government approved of a detailed soil survey to be carried out on approximately one million acres of coastal land. The details of the proposals have been completed and the project will commence early in 1961.

Crop Production Trials and New Crops

Introductions of varieties of Tomatoes, French Beans, Pole Beans, Mung, Blackeye peas, Urid, Cucumber, Eggplant, Musk Melon, Water Melon, Ochro, Cauliflower, Cabbage, Onions, Sweet potatoes, and Field Corn were made for quality and resistance to disease. The main emphasis was placed on Tomatoes in a search for varieties resistant to Bacterial Wilt, Spotted Wilt Virus, Mosaic, Phoma fruit rot and Collar rot. Varieties were imported from the United States through the help of the International Cooperation Administration and one of the varieties Pink Shipper has shown very good promise in field trials. Bacterial Wilt Virus, Mosaic and Blossom End Rot were recorded. Excellent cabbage was grown by a farmer in the Mahaicony area and consumers who purchased the cabbage from the Government Produce Depot reported favourably on the taste and quality of it. Government, so as to encourage the planting of onions and cabbage is offering

a bonus of \$20 per acre. From the trials carried out at the Central Agricultural Station, limited quantities of good quality seeds of Mung, Blackeye peas, Eggplant, Musk Melon (Cantelope), Water Melon, Tomatoes and Ochro were made available to farmers at reasonable prices.

A variety of pulses are being grown at the Central Agricultural Station and this phase of research is given priority in an effort to find a suitable legume to replace the imported article which forms a very substantial proportion of imported foods in the Colony. Experiments with new crops have shown that Sesame (*Sesamum orientale*), Castor (*Ricinus communis*), Dhall (*Cajanus cajan*), Blackeye pea (*Vigna sinensis*), Mung (*Phaseolus radiatus*) can be grown successfully on well drained beds of pegassy clay. Since rice also grows successfully on such beds, an attempt is being made to study a rotation system with these crops in order to replace at least partially the monoculture which is now being practised with rice. In addition, most rice farmers grow one crop of rice and these short term crops might be successfully cultivated during the period the land is lying fallow.

The local selection D 6002 of *Cajanus cajan* is now being ratooned for the third time, having given a yield of approximately 1,822 lb. of the dry seed per acre over a period of less than 18 months. The mortality rate of other varieties tried out is high after the first harvest. The cost of harvesting *Cajanus cajan* has been very much reduced by cutting off stems with ripe pods, drying and threshing on a concrete floor with pneumatic tyred tractors. Shelling of the grain is more effective if it is soaked and dried twice instead of once. Soaking is done in warm water at a temperature of 70° - 80°C and the first drying is done for one day, whereas the second drying is carried out until the testa become brittle and loose. The varieties D 6002 and Farm Lime imported from the Imperial College of Tropical Agriculture, Trinidad, are distributed to farmers freely and bonuses of \$20 per acre are also being paid by Government.

Three varieties of Blackeye peas (*Vigna sinensis*) with large, medium and small grain respectively have been tested and it has been decided to recommend mainly the large seeded variety BE 6011 to local farmers because it is more popular with the housewife, and it ripens more evenly than the other varieties. Its yield per acre is in the neighbourhood of 600 lb.

Variety K 6002 of Mung (*Phaseolus radiatus*), a local selection made by the present Director, Mr. G.B. Kennedy some time ago, has been found to grow vigorously and yield above 500 lb. per acre on the average. It is being recommended to farmers.

Varieties of Castor (*Ricinus communis*) TMV1, TMV2, TMV3, Rosy and HC6 have given satisfactory yields when ratooned or left to produce a second crop after the first or plant crop. The yields of beans from a second crop of four of them taken in the Autumn of 1960 are given below.

Variety	Yield of beans lb./acre
TMV 2	833
Rosy	756
TMV 1	686
HC 6	638

The varieties of Sesame (*Sesamum orientale*), Aceitera, Acarigua and strain 1 have continued to give

satisfactory yields. Sowing by broadcasting at 6 lb. per acre has proven to be satisfactory. Yields of seeds obtained are of the order 500 - 550 lb. per acre.

Various open pollinated strains of maize (Zea mays) and a hybrid line imported from the United States of America and tested in large plots at the Central Agricultural Station have given yields varying from 2,500 to 2,800 lbs. of grain per acre. A local selection C 6009 has also given satisfactory yield and is recommended to farmers. A sweet corn known as Hawaiian Sugar, and introduced from the United States of America by the International Cooperation Administration Mission operating in British Guiana, promises to be popular as a table corn and is being multiplied.

Investigations on the production of good quality papain from papaw (Carica papaya) continued. The variety Solo Hawaii, imported from Ceylon did not grow well. Strains of local selections have done reasonably well but praedial marcenry of the fruits is a serious setback in computing yields. Fresh seeds have been imported from Tanganyika, East Africa and these have been planted in nurseries.

Observational trials have shown that the pegassy clay is more suitable for the growing of bananas than the heavy coastal clay. The most promising varieties for yield and quality so far are Lacatan, Congo which were obtained from Surinam, and Dwarf, a local strain. The main disease affecting bananas was "Moko" disease (Pseudomonas solanacearum). Panama disease (Fusarium oxysporum) and leaf spot (Cercospora) were also reported but damage was little compared with Moko. Banana is not an export crop.

Coconuts

On account of shortage of edible oil in the country thereby necessitating importation of this commodity, the policy of Government is to encourage the expansion of coconuts and the rehabilitation of old plantations by the production and distribution of quality seedlings to farmers at subsidised prices. During 1960, a bonus of \$20 per acre was paid for new plantings. The five-year Development Programme of Government has set a target of 10,000 acres of new plantings, that is about 2,000 acres per annum. In 1960, nearly 136,000 good quality seedlings, propagated at the Central Agricultural Station were distributed to farmers. This number of seedlings will plant about 2,000 acres. So as to minimise the damage to seedlings, in the process of transportation in trucks to the various districts, nurseries have been set up in Suddie, Essequibo, Whim, Corentyne and Moruca, North West District. Each nursery should be able to propagate around 50,000 plants. Good quality nuts are selected from plantations by selection of blocks of good palms and in some instances by selection of good individual palms. The weather condition in 1960 was satisfactory and the yield of coconuts per palm on some of the better plantations was much better than the previous year. The Department of Agriculture paid to plantation owners approximately 7¢ for each selected nut, exclusive of cost of transportation. The percentage germination of nuts purchased varied from 50 - 60 per cent and in a few isolated cases the figure was as high as 80 per cent. Before seedlings are distributed a final selection is made in the nurseries based on vigour and general appearance of the plants. A farmer pays 5¢ for a seedling of his choice. A permanent grove is in the process of establishment at the Central Agricultural Station using seedlings obtained from specially selected palms and so far the young trees are doing

excellent. Kudzu is recommended for intercropping in coconut plantations.

Fertiliser experiments were continued during the year on farmers' holdings and in many instances significant responses to limestone in particular, and a mixture of nitrogen, phosphate and potassium were obtained. On one coconut plantation situated at the mouth of the Pomeroon River and on its right bank, mature and bearing coconut trees were dying. The drainage of the plantation was improved and the recommended applications of fertilisers by this Department which included 20 lb. of ground limestone per tree applied once in about three to four years, depending on the condition of the trees, four pounds of sulphate of ammonia, three pounds of triple superphosphate, and three pounds of muriate of potash per tree, were given and the trees in the experiment have increased their yields and the mortality was checked. The above formula corresponds to 10 lb. per acre of an 8:12:15 mixture.

Further trials were carried out on Frontland clay at Cove and John on the East Coast of Demerara. 8:12:18 and 4:12:18 ready-made mixtures purchased from one of the fertilizer firms were tried out at 10 lb. per tree and in addition 25th of limestone per tree was applied. The results clearly indicated the superiority of the 8:12:18 mixture and increases in nuts per tree ranged from 10 to 32 compared with the untreated plots. In another trial, fertilizer in conjunction with the insecticide dieldrin was tried against Castnia. The soil type was frontland clay and the trees averaged about 15 - 20 years. The fertiliser used was 7 lb. of 10:20 NP and 3 lb. of muriate of potash per tree. In addition each tree was given 15 lb. of ground limestone. The fertiliser plus the dieldrin gave the best yield of 119 nuts, the fertiliser only gave 86 nuts and the untreated trees, 60 nuts per tree. It was evident from the results obtained that the trees were attacked by Castnia.

In the Pomeroon River, remote from its mouth, where mature and bearing trees have been dying at an increasing rate, fertiliser experiments have shown that the death rate was reduced somewhat by the use of lime, mixed fertilisers of NPK and magnesium with fritted trace elements and in some instances the life of the palm was prolonged. It would seem that the soil of this area where the death rate was alarmingly high, was of a pegassy nature and is not suitable for coconuts. The Department of Agriculture is not recommending bonuses for new plantings of coconuts on the pegasse (peat) soils. There is some indication that Red Ring disease might be present on the Essequibo Coast.

Pests and Diseases

A large number of trees died during the year from Bronze Leaf Wilt disease which was observed in various parts of the coconut producing areas, particularly on poorly drained and heavy clay soils. Farmers were advised to improve the drainage of the soil and avoid overcrowding of trees. Bud Rot (Phytophthora palmivora) was also observed in a few instances but the incidence of this disease was not very high to cause any serious damage.

The coconut caterpillar (Brassolis sophorea) and the Rhynchophorus beetle (Rhynchophorus palmarum) were reported to attack palms throughout the country. The attack by caterpillar was most severe on trees nearer to the sea-coast. Control of caterpillar was effected by hand-picking them while spraying the roots of the palms with Aldrin solution controlled the beetle.

The coconut moth borer (Castnia daedalus) continued to affect production of coconuts in the country. Effective control of this pest has been obtained by spraying the canopy of the palms with one per cent of dieldrin solution and where this practice has been adopted on plantations, increase in yield of nuts per tree has resulted. Observational trials which had commenced on a few plantations, have indicated that there is no relationship between manurial treatment of trees and the incidence of Castnia. Peasant farmers have been slow in using dieldrin but the large plantation owners have been more responsive. There was no new outbreak of locust (Tropidocris latreillei).

Citrus

Citrus and limes are being expanded on land settlement schemes. The Department supplies budded plants to farmers. Fertiliser trials continued at Pln. Georgia, left bank of the Demerara River, on the banks of the Pomeroon River, at Bartica and in the North West District, have further indicated that an 8:12:15 mixture of N,P and K at the rate of 5 to 6 lb. per bearing tree twice per annum and just before the bearing period has given significant responses in increased number of fruits of good quality and in addition the trees had a healthy appearance. About 10 lb. of ground limestone once in two to three years on the silty clays found on river banks proved beneficial. At Bartica, where the soil is sandy, responses were obtained from a mixture of NPK particularly K. Trace elements did not give any noticeable response. In the Pomeroon River where the soil is pegasse (peat) of nearly three feet in depth, limestone is essential in addition to the recommended mixture of NPK (8:12:15). Many farmers are convinced with the beneficial results obtained from the use of fertilisers and consumption of artificial fertilizer is gradually increasing with the expansion of this crop. Trees which had not borne fruit for 25 years since they were planted are now giving a satisfactory crop through adequate applications of lime and NPK fertilisers. In the North West District where the soil is of ironstone formation (lateritic clay) excellent responses were obtained from applications of inorganic fertilisers mixed with pen or poultry manure. Preliminary trials have indicated possible deficiency of manganese and zinc. The orchard at Hosororo has been expanded. Old citrus trees have been severely pruned and fertilised. Their condition and bearing have improved. At Ebini, on the Livestock Station, right bank of the Berbice River, where the soil is sandy and of low fertility, zinc deficiency was observed on the majority of citrus trees. Treatment with zinc sulphate gave marked improvement. At the Central Agricultural Station the varieties of oranges and grapefruit imported from Trinidad, have made excellent progress. Kudzu is used as a cover crop and is cut back periodically to prevent it climbing on the plants.

Pests and diseases

There was no serious pest reported during the year. The citrus black bee (Melipona guinea) caused some damage in scattered areas in the country. Spraying with a mixture of Malathion and sugar was effective in controlling the pest.

Citrus Scab (Elsinoe fawcetti) caused considerable damage to thousands of seville orange seedlings propagated in the nurseries of the Department and they had to be destroyed. New seedlings are sprayed with Bordeaux mixture and Perenox and so far the disease has been brought under control.

Cocoa

This crop from investigations carried out by the Department of Agriculture has been proved suitable for the riverside silty clay soils. Messrs. Booker Bros. Ltd. are in the course of establishing as a start about 1,000 acres. Over 450 acres have already been planted on some of their estates. Prospective farmers on Government Land Settlements and on free-hold holdings are encouraged to grow this crop. The Government is offering a bonus of £30 per acre for new plantings. Peasant farmers on land settlements in spite of the bonus offered are not showing any great desire for this crop.

Cushion Gall disease has been a set back in the expansion of this crop, and the emphasis is now placed on hybrid seed rather than on the I.C.S. clones which seem to be susceptible to the disease.

THE EXTENSION SERVICE

Organisation

The Extension Service of the Department is directly administered by an Assistant Director with Agricultural Officers in charge of each of the five major agricultural districts and two Agricultural Officers at Head Office, one in charge of Land Development and the other in charge of Rural Youth Work, Agricultural Education and Information. In addition, an Agricultural Officer was stationed in the Amerindian reservation of Kamarang and the Agronomist stationed in the Rupununi carried out some extension work with Amerindian and other farmers in that area. There were also the Agricultural Assistant (Rural Youth Work) and the Bee Officer who continued to operate from Head Office.

Staffing

As a result of staff shortage and officers on vacation leave and study leave, there were no less than 7 acting appointments in the Agricultural Officer and Agricultural Assistant grades. The number of Field Assistants at the end of the year was 42 including one officer engaged in Plant Protection work, two on Education and Information, two officers seconded to work with International Cooperation Administration Specialists and five female officers engaged exclusively with Rural Youth Work, mainly Home Economics.

During the year two Field Assistant resigned to pursue further studies in Agriculture. Additions to the staff were one Agricultural Assistant, a graduate from the Imperial College of Tropical Agriculture and eight Field Assistants, graduates of the Eastern Caribbean Farm Institute. The former was posted to work with rice experiments at the Mahaicony/Abary Rice Development Company, and the latter were posted to work in the rural districts. The four Field Assistants who were undergoing a two years' course of training at the University of Puerto Rico successfully completed their course and returned to the colony at year end.

One student from the 1959-61 class of cadets at the Eastern Caribbean Farm Institute resigned his studentship and the remaining seven proceeded to the second year. Seven cadets including one Prison Officer were selected for the

1960-62 course, so that the total number of students at year end at the Institution was fourteen.

Programme of Work

As in previous years, programmes of work were prepared for each district and efforts were concentrated on the plans set out for agricultural improvement viz.

Rice: Early planting, the control of red rice and the use of treated pure line seed for control of water weevils and brown spot and (Helminthosporium) The use of fertilisers and insecticides to control padi bug.

Sugar

Cane: Planting of the recommended standard variety B 41 - 227, the increased use of fertilisers and more wide spread use of flood fallowing, - encouraging farmers to take up the additional acreage granted for peasant cane farming.

Coconuts: The drive to increase the acreage under coconuts and to re-habilitate existing poor cultivation was continued. To stimulate planting, a bonus of \$20.00 per acre was offered for new cultivation satisfactorily established. The use of fertilisers, improved drainage and irrigation, the planting of selected seedlings and interplanting with catch crops (dhall, castor oil, plantains, etc.) to assist in reducing the cost of establishment were also given prominence.

Cacao: Use of improved clones and hybrid seedlings.

The planting of satisfactory temporary and permanent shade, increased acreage, use of fertilisers, the control of insect pests and diseases, and cooperative fermentaries. A bonus of \$30.00 per acre was offered for new cultivations satisfactorily established in order to stimulate interest in cacao cultivation.

Coffee: Pruning for easier picking and increased yields, use of fertiliser, control of disease and cooperative processing and marketing.

Citrus: The use of fertiliser and trace elements, restriction of inter-cropping, planting of cover crop, control of insect pests and diseases, better handling, grading and co-operative marketing.

Vegetables: A bonus of \$20.00 per acre was offered to stimulate interest in the cultivation of cabbage and onion. Increased use of organic manure and artificial fertilisers and the control of insect pests and diseases.

New Crops: Bonus payments of \$15.00 per acre plus a guaranteed minimum price was offered for blackeye peas, mung, arhar dhall, sesamum, castor oil and urid in order to encourage crop diversification.

Dairy
Production:

The drive to improve the hygienic quality of milk was continued. Planting of fodder, more attention to the feeding and management of calves, feeding of minerals, use of artificial insemination, de-worming and castration of scrub bulls were stressed. A bonus payment of \$25.00 was offered for every acre of pasture or fodder satisfactorily established.

Pigs: Better feeding and management especially of breeding stock. Credit for feed was provided by the Marketing Division for recommended farmers in order to encourage the use of balanced ration.

Poultry: The drive to increase egg production was continued. The use of deep litter, proper sanitation and the use of balanced ration received special attention. Grading and cooperative marketing of eggs were recommended.

Rural Youth: Development of rural leadership, improved health through better nutrition and improved methods of farming and home-making. Greater stress on agriculture in project work in order to increase and accelerate the work of the Department.

School Gardens: Stimulation of Students' interest in agriculture, improvement and satisfactory maintenance of gardens.

Extension Methods:

Field Officers continued to make use of the usual techniques viz. meetings, discussions, visual aids, etc. to secure the adoption of new and improved farming methods and fulfilment of the programme of work. These methods may be classified as:-

1. Individual methods
2. Group methods and
3. Mass methods.

Individual Methods:

This was the main source of teaching farmers for personal contact in the home, field, demonstration station or the office still remains the most effective means of reaching the farmer under conditions obtaining in British Guiana.

The Progressive Farmers' Scheme which was introduced in 1959 was continued, but the results were very indifferent. There are indications that the method of selecting farmers for this scheme ought to be revised and better credit facilities need to be provided for selected farmers. Of the total of 25 projects started in 1959, two were successfully completed, two partially successful and eight had to be abandoned for various reasons e.g. inability of the farmer to honour his side of the agreement, inability to purchase feed, poor husbandry, etc. Sixteen new projects were started in 1960, in addition to projects brought forward from 1959.

In addition, variety and manurial trials with rice, fertiliser trials with coffee to control sclerotium disease, a spraying trial to control cockles on tannias, a fertiliser trials with citrus and avocado pear and demonstration with fodder grasses on pegasse soils were carried out on farmers' plots.

Farm visits and interviews estimated by the field officers for 1960 were 28,650 and 34,900 respectively.

Group Methods:

During the year effective use was made of meetings, group discussions, film shows and demonstrations to communicate information and new techniques to farmers.

Field Days were arranged in several districts and were used to focus attention on production of clean milk, poultry rearing, cacao and citrus cultivation, pasture improvement and some of the new crops for which Government was offering incentive bonus payments. Field officers and specialist staff gave lectures and demonstrations at these Field Days. Seminars were also held in some districts to supply information on poultry and pig-rearing and crop husbandry.

Fifty-four (54) Field Days were recorded during 1960. In addition, there were 1,045 meetings called or attended (exclusive of 4-H and Young Farmers' meetings), 22 film shows and 909 demonstrations.

Mass Methods:

The radio programme "Rural note-book on the air" sponsored by the Government Information Services, was continued throughout the year. In addition to topics of agricultural interests which were featured from time to time in the Government Bulletin and the Daily Papers, leaflets and bulletins prepared by the Department were also distributed.

Among the scripts featured for broadcasting were the following:-

- (a) Information on Tobacco - growing and planting.
- (b) The coffee industry in the North West District.
- (c) Coffee - care of the young coffee, care of the mature coffee, picking and processing the crop.
- (d) Cocoa - its pests and diseases.
- (e) Cocoa in the development programme 1960-64.
- (f) How Government intends to develop cocoa cultivation.
- (g) Beef in the development programme.
- (h) Rice in the development programme.
- (i) Milk in the development programme.
- (j) Grassland and grassland improvement (series of 5 talks).
- (k) Control of paddy bug.
- (l) Crop bonus schemes viz.
 - (i) new land establishment in cocoa;
 - (ii) new land establishment in coconuts;
 - (iii) land planted in pure stand of onions and cabbage;
 - (iv) acreages planted to mung, urid, arhar dhall, blackeye peas, sesame, castor beans and pea-nuts;
 - (v) construction of fish trawlers.
- (m) The feeding of pigs - series of 6 talks.
- (n) The Plant Pathologist and some of his duties.

There were also weekly broadcasts of retail farm prices.

New leaflets and bulletins issued during the year were as follows:-

- i) Control black spot or other forms of discolouration in padi;
- ii) Buttery laying cage - revised edition;
- iii) Why and how to control Jharanga or drop-seed in rice field;
- iv) Cash bonuses for farmers;
- v) Sowing Victoria Regia seed;
- vi) Presentation on soaking treated seed padi;
- vii) Coconuts;
- viii) Cabbage;
- ix) Cocoa;
- x) Peanuts
- xi) Onions;
- xii) Organic manuring;
- xiii) Control padi bug;
- xiv) Cocoa, a crop with a future;
- xv) Home-made cheese;
- xvi) Direction for producing good milk;
- xvii) The four vertical multiple stem system of pruning coffee;
- xviii) Dairying;
- xix) Processing of cocoa beans for marketing.

The Farm Journal was brought up to date, there being four (4) issues viz. December, 1959, March 1960, June 1960, and September 1960. Material for the December 1960 issue was submitted to the Government Information Services for publication.

Departmental exhibits were displayed at the League of Coloured People's Fair, the Indian Education Trust Fair, also at Skeldon and the Union of Local Authorities's Exhibit at Wakenaam and Eastern Berbice. The Crop and Livestock competitions were held in conjunction with the Union of Local Authorities' Exhibitions.

Services to farmers:

1. Fertilisers, insecticides and other material

Selected agents continued to serve as distributors for stock feed and fertilisers and to a limited extent fungicides, except in some riverain areas where satisfactory agents were unavailable. Field officers, however, continued to be responsible for veterinary supplies and vegetable seed. Soil samples and specimens of diseased plants and animals were also collected by field officers and forwarded to the specialist officers for analysis, advice and diagnosis.

2. Pure Line Seed Padi

The distribution of pure line seed padi still left much to be desired. No. 79 and D 110 were still almost exclusively the main varieties distributed. Distribution was as follows:-

Berbice	3,884.5	bags of	140
East Demerara	1,466.5	"	"
West Demerara	64.0	"	"
Essequibo	608.0	"	"
Mahaicony/Abary Rice			
Development Company	900.0	"	"

An estimated total of 8,000 bags of (140 lb. nett) pure line seed was produced at Cano Grove and Anna Regina Land Settlements under the supervision of Pure Line Seed Padi Supervisors. Unfortunately a fair amount of the seed padi at Anna Regina had to be rejected because of red rice content in excess of 2%. In addition, seed padi purchased under the growers' scheme was as follows:-

West Demerara	121.0 bags of 140 lb.
Berbice	240.0 " "

The price farmers paid for pure line seed was \$8.55 per bag and after drying, cleaning and winnowing, this was sold to farmers at \$9.55 per bag.

In an effort to control rice water weevil damage, and also brown spot of rice caused by the fungus (*Helminthosporium oryzae*), pure line seed padi treated with an organo mercuric fungicide was offered for sale to farmers. Farmers tended to be reluctant to purchase treated seed, mainly on account of the additional cost of 30 cents per bag. However, those who purchased treated seed expressed satisfaction with the results obtained.

Cooperative Thrift and Credit Societies were the main agents through which seed padi was sold to farmers. This was particularly so on the Land Settlement Estates, since one of the terms of tenancy of the New Land Settlements was the use of pure line seed padi.

Work was started on the creation of a new seed padi bond at the Lesbeholden Section of the Black Bush Polder Settlement. This bond will be used to store seed padi grown on the Settlement for distribution to settlers. It is estimated that 12,000 bags of (140 lbs. nett) will be required for distribution to settlers for the 1961 Autumn crop.

3. Economic Plants and breeding stock

With the exception of clonal and hybrid seedling cocoa, the demand for planting material viz. budded citrus, grafted oranges and avocado pear, sundry fruit and other commercial plants was always in excess of production. In order to offset this unsatisfactory situation, every effort was being made to increase the production of nursery plants especially oranges, lime and grapefruit.

As a result of production of chicks by franchised dealers of recognised United States poultry breeders in addition to production by the Department of Agriculture, farmers were able to secure a satisfactory supply of chicks for egg production. The imports of chicks from the United States of America for broiler production were however still very high and breeders were being encouraged to increase the production of this type of chicks. 24,794 chicks were distributed through the extension staff.

With the increasing interest in pig rearing, the demand for weaner piglets increased thus aggravating the already poor supply situation. In order to assist farmers, field officers assisted in securing small supplies from the Mazaruni Prison, the Demerara Bauxite Company Farm and the Essequibo Boys' School. 189 piglets were distributed through the extension staff.

There was a strong demand for dairy cattle. Two sales of grade Holstein heifers and cows were held at the Agricultural Station. Direct sales to selected farmers were also arranged. In addition, 13 heifers under the revolving heifer scheme were distributed.

4. Agricultural Demonstration Stations and Nurseries

Demonstration Stations and Nurseries were maintained in the three counties. In Berbice, a new demonstration station was established thus bringing the total to thirteen situated as follows:-

i)	No. 63	-	Nursery
ii)	Whim	-	Nursery
iii)	Mara	-	Nursery
iv)	Schepmoed	-	Demonstration Station
v)	Onverwagt	-	Demonstration Station
vi)	Garden of Eden	-	Demonstration Station
vii)	Charity	-	Nursery
viii)	La Belle		
	Alliance	-	Nursery
ix)	Maria's Lodge	-	Nursery
x)	Suddie	-	Nursery
xi)	Bartica	-	Nursery
xii)	Hosororo	-	Demonstration Station and Nursery
xiii)	Kumaka-Quebana Road	-	Demonstration Station.

Berbice

At No. 63 work was concentrated on the production of citrus and coconut planting material. 3,977 coconut seedlings were distributed from last year's setting, and 30,000 set for 1960 - of the latter 5,000 should be available for distribution early in 1961.

598 budded oranges and 168 grape-fruit plants were distributed. A start was made with the production of miscellaneous fruit plants, mainly mangoes, for distribution to farmers. It is hoped to be able to produce 500 grafted mangoes during the year. In addition a demonstration plot with Pangola grass was also put down.

At Whim, a complete change over from vegetable garden demonstration to citrus nursery was effected. This station was also used as a base for the distribution of coconut seedlings received from the Central Agricultural Station, Mon Repos.

The Providence Cocoa Nursery had to be closed down in June as a result of the outbreak of cushion gall. The nursery unit was transferred to Mara Land Settlement Estate where it was established in conjunction with a citrus nursery. By year end 2 acres were cleared and prepared for citrus seedlings and a cocoa propagation shed was erected. 3,500 wild grape-fruit seedlings were planted out, and the budding of limes on these was begun - 100 cocoa seedlings were produced.

The demonstration plot for this Mara Land Settlement which is located at Schepmoed, was maintained. The citrus (limes, oranges and grapefruit) and cocoa plots were progressing satisfactorily. Blackeye peas, arhar dhall and other crops for which Government was paying an incentive bonus were being grown as shade and/or cover crops and as demonstration to the settlers. Some Lacatan bananas and black-pepper vines were also planted for demonstration.

Work on the Onverwagt Station was begun in October and by year end the following was accomplished:-

- (i) 6.3 acres of land were cleared and empoldered.
- (ii) 4.5 acres of land were under coconuts.
- (iii) 1.0 acres of land was sown to castor beans.
- (iv) 1.0 acres of land was sown to arhar dhol.

Demerara

In Demerara, the Atkinson Field Nursery and Garden of Eden Demonstration Station were maintained. At the former, the cocoa extension work progressed very satisfactorily and the production of plants (both clonal cuttings and hybrid seedlings) was markedly increased. In the case of citrus, however, production was very seriously affected by scab disease. Despite spraying with different types of fungicides, fertiliser applications and other improved agronomic techniques, severe losses were caused by the scab disease. At one stage 50,000 seedlings had to be destroyed. Distribution of plants were drastically reduced and only 4,634 plants were distributed as compared with 13,511 the previous year. At year end, however, there were 4,079 available for distribution.

With respect to cacao propagation, the following is a summary of the year's work with cuttings:-

No. of cuttings propagated	- 70,900
No. of plants distributed to farmers	- 22,806
No. of plants on hardening floor	- 10,283
No. of plants available for distribution	- 9,000

In addition, 92,000 hybrid seeds imported from Trinidad were sown direct into plastic bags and baskets. The summary of hybrid seed propagation and distribution is as follows:-

No. of seeds sown	- 92,000
No. of seedlings distributed to farmers	- 8,680
No. of seedlings on hardening floor	- 43,037
No. of seedlings available for distribution	- 20,000

At the Garden of Eden plot, a Kingstrand Aluminium House was erected for a caretaker and the dairy pen and loafing shed was almost completed. The entire 22.525 acres were cleared and divided into four major sections, viz., Pasture, fodder grass, citrus and building compound.

These sections were all completely established as follows:-

- (i) Pasture - $7\frac{1}{2}$ acres planted with Locuntu grass (Ischaemum timorense)
- (ii) Fodder grass - $7\frac{1}{2}$ acres planted thus
 - (a) Para - 5 acres
 - (b) Elephant - $\frac{1}{4}$ acre
 - (c) Guinea - $\frac{1}{4}$ acre
 - (d) Guatemala - $\frac{1}{4}$ acre
 - (e) Pangola - $1\frac{3}{4}$ acres

The Pangola is mainly as a nursery to supply planting material to settlers.

- (iii) Citrus (mainly orange) and catch crops -
5 acres.

Lacatan banana, plantain, tannia and corn were planted as catch crops but mainly as demonstration and to supply planting material for farmers.

Essequibo

In Essequibo the following nurseries were maintained:-

- (i) Charity Coffee Nursery
- (ii) La Belle Alliance Cocoa Nursery and citrus block for scion material.
- (iii) Maria's Lodge and Suddie Citrus Nurseries.
- (iv) Bartica Citrus Nursery.

The Charity nursery suffered from bad drainage facilities, and the Public Works Department was asked to correct the situation as the drainage of this nursery is tied up with the Government Compound of the area as a whole. A total of 1,208 coffee seedlings were distributed from this nursery.

At La Belle Alliance, the cocoa propagation work was continued but the demand for cacao plants was very slow and it was decided to limit this work and substitute the citrus propagation. Summary of the cacao propagation work for 1960 is as follows:-

(i)	Plants brought over from 1959	4,208
(ii)	No. of plants propagated	8,800
(iii)	No. of plants distributed	4,620
(iv)	No. of plants supplied to nursery field	603
(v)	No. of plants available for distribution	5,802

In addition to cacao and citrus work, coconut seedling propagation was started at this nursery. 31,340 selected nuts supplied from the Central Agricultural Station were set, of which 1,029 had germinated by year end.

The Suddie Nursery produced vegetables for the Public Hospital, Suddie for the first half of the year, and then changed over to the production of budded citrus plants for the second half. The Maria's Lodge Nursery produced budded citrus plants throughout the year. Summary of production is as follows:-

	<u>Suddie</u>	<u>Maria's Lodge</u>	<u>Total</u>
No. of plants distributed	359	1,113	1,472
No. of plants available for distribution	165	1,290	1,455
Seedlings in ground	2,045	2,135	4,180

In addition, 7,775 selected nuts supplied from the Central Agricultural Station were planted at the Maria's Lodge Nursery.

The Bartica Nursery was adversely affected by the dry weather during the first quarter of the year and later by the poor viability of sour orange seeds supplied from the Pomeroon area. As a result only 267 plants were produced for distribution and supplies had to be obtained from Suddie to meet the local demand.

North West District

In the North West District, extension of the Hosororo Station was continued. The following were the main works carried out:-

- (i) Clearing of 8 acres of swamp land for coffee cultivation.
- (ii) Preparing of 27½ acres of land, without burning, for cocoa of which 19 acres were established.
- (iii) Building of roads to new cultivation
- (iv) Extension of the propagating Unit.
- (v) Building of Staff houses.
- (vi) Erection of a 20,000 gallons cistern on the crest of the hill to store water for use during the dry season.

In addition the plots of citrus, cacao, coffee, avocado pear, coconuts, pine-apple, vegetables and grasses were maintained. Experiments with fertilisers, insecticides, weedicides, fungicides, land clearing and establishment of cacao were carried out. The seedling plot of cacao was weeded, pruned and fertilised. From it 4,266 pods were reaped, and these yielded 710 lb. of cured beans.

The small plot of dwarf coconuts bore for the first time.

The old avocado pear section produced a fair crop, but the fruits were small and badly marked. The new section planted in 1955 did not bear well.

The small plot of ginger gave poor results. Arhar dholi was tried on the hill and the plants grew well. It should be a good temporary shade for cacao.

Summary of the production by the cocoa nursery is as follows:-

(i)	No. of cuttings propagated	-	22,560
(ii)	No. of plants distributed to farmers	-	4,760
(iii)	No. of plants planted on the station	-	5,827
(iv)	No. of plants on hardening floor-	-	8,218
(v)	No. of hybrid seeds set	-	1,600
(vi)	No. of hybrid seedlings planted on the station	-	300
(vii)	No. of hybrid seedlings available-	-	1,300

Distribution of other economic plants to farmers in the district was as follows:-

(i)	Oranges	-	3,186
(ii)	Limes	-	799
(iii)	Grape-fruit	-	60
(iv)	Dancy Tangerine	-	02
(v)	Avocado pear	-	141
(vi)	Coconuts	-	745

In the swamp area rice experiments were discontinued but the fertiliser trials with pine-apple were maintained. The plants were however adversely affected by poor drainage.

The small unit of six cows and one bull was maintained. Six calves (4 heifers and 1 bull) were born, and 5 heifer calves and 2 bull calves were sold to farmers in the district. Milk production recorded was 13,484 pints and this was disposed of as follows:-

(i)	Fed to calves	4,219 pints
(ii)	Sold in the district	- 9,108 "
(iii)	Fed to pigs	157 "

The poultry flock was disposed of as chicks were easily obtainable in the district either from commercial hatcheries or from the Central Agricultural Station.

The pig unit suffered a bad set back as the two mature large white sows had to be sold for slaughter. For two successive litters these sows could not nurse their piglets, as they had no milk after farrowing. One of the large white boars had to be sold for slaughter as he had developed a paralysis of the hind limbs. The other also was sold to a farmer for breeding. At year end the unit consisted of a large black bear, a large white sow and 5 cross-bred piglets. 18 weaner piglets produced at the unit were distributed to farmers.

At Moruca, further development work was carried out at the Kumaka-Queb na demonstration station. A house was being erected for the caretaker and the coconut nursery was removed from the Government compound at Acquero to the demonstration station.

The coconut planted under shade of plantains and bananas on land not burnt was doing well. Both plantains and bananas began to fruit in nine months, but unfortunately, Moko disease killed a large number of suckers and about 4 acres of suckers were dug out and burnt in an attempt to retard the spread of the disease and to control it.

Cocoa planted under natural shade and where satisfactory temporary shade was established made satisfactory growth.

Pine-apple planted in strips as an anti-erosion measure did not make satisfactory growth. Peanuts planted for demonstration did not fruit well, probably due to heavy rainfall at flowering time. Pangola grass planted in contour strips and as ground cover grew exceedingly well and made an excellent ground cover.

6,847 coconut seedlings were distributed to farmers, but following the introduction of an incentive bonus payment and a charge of 5 cents per plant, the demand for plants greatly diminished. As a result, a large number of plants was on hand at the station.

5. Duty-free petrol

This time absorbing and often much abused regulatory duty continued to be handled by field officers. Details of distribution in comparison with the previous year were as follows:-

	<u>Year 1960</u>	<u>Year 1959</u>
	Glns.	Glns.
Rice	598,825	531,580
*Sugar Cane	78,332	96,437
Ranching	6,440	4,725
Other	5,425	6,195
Total	689,022	638,937

* Issued direct to the Sugar Estates on the draw back system.

Local Authorities

The Extension Staff maintained their close relations with the Local Authorities, and continued their help with the community projects at Crabwood Creek, Berbice, Golden Grove-Nabaclis, East Demerara and Huis t'Dieren, Essequibo. In addition, field officers took an active part in rural self help projects. The availability of land for the extension of peasant cane farming was worked out in conjunction with the Local Authorities concerned.

Regional Development Committees

Extension officers continued to serve as members of Regional Development Committees and area sub-committees and to advise concerning economic agricultural projects.

Machinery Hire Pools:

This scheme continued in operation and extension Officers served as members of the area committees.

Crop Valuation:

Although the Drainage and Irrigation Department retained the services of a Crop Evaluator, extension officers had to act from time to time as referees and to assist in the valuation of lands compulsorily acquired by Government and also in the compensation of crops, damaged by flooding or land utilised for development projects e.g., Sea Defence, Irrigation and drainage Canals etc.

Rice Farmers' Security of Tenure Committee

Members of the staff served on these statutory Committees which fix rents for rice land and settle matters concerned with landlord/tenant relationships.

Agricultural Education and Information

Close collaboration between Garden teachers and Agricultural Field Assistants was maintained. In many districts, weather conditions in the early part of the year were not favourable for gardening but field officers continued paying scheduled visits and gave lectures on topical subjects e.g., application and the use of fertilisers, rotation of crops, cover-cropping, budding citrus, etc.

The number of gardens remained the same as in 1959, viz. 112. These were also distributed the same as last year, viz:-

Berbice	-	37
East Demerara	-	36
West Demerara	-	14
Essequibo	-	<u>25</u>

Total - 112

Fifty-five schools received maintenance grants totalling \$1,304.55 and sixteen schools received grants amounting to \$1,837.53 to build fences, purchase tools and dig fish ponds.

The annual school gardening competitions were judged by visiting officers and in addition to prize awards, certificates of merit and certificates of satisfactory work were

issued as a result of the judging. The Mahaica Church of Scotland with a score of 87% was judged the best school garden in the colony and was awarded the Bannister Shield.

Under the two-years' agricultural apprenticeship scheme, six apprentices completed their course of training, four resigned and eight were appointed to undertake the course.

The Information Division, despite the limited staff, gave invaluable help to extension and specialist officers during the year, and it is with regret that the death of Mr. E.G.B. Jones, temporary Field Assistant attached to this Division is recorded. Towards year end the division was strengthened by the addition of two officers who had returned from a two-year course of training at the University of Puerto Rico.

Scripts as mentioned elsewhere in this report were prepared and submitted to the Government Information Services for broadcast. In addition 43 news releases were submitted to the Government Information Services for publication.

Nineteen new publications as mentioned elsewhere were also prepared for distribution, as well as hand-outs for exhibitions and programmes for Field Days.

Rural Youth Work

Staff shortage and the consequent transfer of junior personnel adversely affected the rural youth programme in some areas. Mr. Don Carter, I.C.A. Rural Youth Specialist, was attached to the Division to assist in further development of the Youth programme with particular emphasis in making the agricultural activities more effective. Late in the year, Mr. Nicholson, who had returned from a two-years' course of training at the University of Puerto Rico, was appointed to work as Mr. Carter's counterpart.

To facilitate supervision of the Youth programme in each district, and in order to afford closer supervision of programmes and activities in the districts, it was decided to appoint Field Assistants to serve as co-ordinators for rural youth work in specific areas. These officers continued with their rural extension work but on a reduced scale and the agricultural districts were divided for co-ordination purposes as follows:-

- (i) Eastern Berbice
- (ii) West Coast Berbice
- (iii) East Demerara
- (iv) West Demerara
- (v) Essequibo
- (vi) Leguan
- (vii) Bartica
- (viii) North West District.

Central Youth Office personnel and district officers arranged leader training meetings and office training meetings in all of the districts. In addition, a special three-day course was arranged for the 1960 E.C.F.I. graduates and other Field Assistants who did not have the opportunity of training in rural youth work. This was a very comprehensive and practical course and enabled young officers to secure very valuable training to assist them in carrying out rural youth work in the districts.

Close collaboration was maintained by the Rural Youth Staff and other allied organisations viz., Social Welfare, Youth Council, Co-operative and Education Departments. 4-H and Young Farmers became members of the B.G. Youth Council and recommendations were put for the formation in early 1961 of 4-H County Committees. These are to include representatives of the Education and Social Welfare Departments as well as a few others not directly involved in the 4-H programme.

The following citizens donated prizes for their areas:-

- (i) Mr. M.H. Rampersaud - 4-H Achievement Cup - Berbice
- (ii) Mr. Z. Ramin - 4-H Achievement Cup - Essequibo
- (iii) Mr. Azeez Khan - 4-H Achievement Cup - Leguan
- (iv) Mr. M.C. Khan - Cup in East Demerara.

It is of special interest to note that features on Fish projects and Block printing appeared in the Ford Rural Youth Almanac. Articles on the Mitchells of Riverstown, Tractor Rodeo and Foods Project were submitted for the 1960 Almanac.

The number of clubs at the end of the year were 45 4-H and 12 Young Farmers with a total membership of 2,628. It should also be mentioned that groundwork has been laid for the formation of at least six new clubs which come into operation early 1961. The distribution of these clubs is as follows:-

TABLE XVI

	No. of Y.F. Clubs	Members		No. of 4-H Clubs	Members		No. of leaders	
		Y.F. Men	Y.F. Women		4-H Boys	4-H Girls	men	women
Demerara	1	30	-	11	83	346	7	31
Essequibo	1	9	13	3	69	49	7	8
Berbice	4	55	36	8	177	281	23	32
Berbice	-	-	-	2	155	181	14	11
Essequibo Coast	4	31	38	9	190	273	22	20
Essequibo Islands	2	10	17	5	132	193	12	15
Georgetown	-	-	-	3	53	74	6	6
West District	-	-	-	4	61	72	10	7
Total	12	135	104	45	920	1469	101	130

The following is a summary of the activities of the Field Staff:-

TABLE XVII

Districts	Activities of Agricultural Field Assistants			
	4-H Meetings attended	No. of members in attendance	Y.F. Meetings attended	No. of members in attendance
Demerara	195	4,728	114	1,668
Essequibo	85	1,627	8	188
Berbice	56	1,604	11	280
Essequibo Coast	142	4,081	39	444
West District	71	2,096	-	-

District activities of the Home Economics Field Assistant

TABLE XVIII

Activities of Home Economics Field Assistants							
District	4-H meet-ings atten-ded	No. of members in attend-ance	Y.F. meet-ings attend-ed	No. of members in at-tendance	Home visits	Inter-views	Meth-Demo-strations
Serbice	172	1,990	115	1,668	362	458	61
Demerara	118	3,433	15	178	232	195	52
Essequibo	112	4,005	37	355	624	284	102

Individual project work continued to be an important feature of 4-H Club Work. Project Record Books for Foods, Clothing, Home Improvements, Gardening, Crops, Poultry and Livestock were introduced early in 1960. These Record Books are used to train members in record keeping.

Project work consists of the following:-

(a) Agricultural - Gardening and poultry rearing continued to be the most popular project, but there were also projects with dairy farming, pig rearing, milch goats, sheep and bee-keeping. 411 members were enrolled for gardening and 316 for poultry rearing. Re the latter, the high cost of feed in some districts was a great drawback. Dr. N. Paulhus, International Cooperation Administration Poultry Specialist who was in British Guiana during 1956-57 returned to the colony on a consultant basis during the month of December and his presence in the country had a very stimulating influence on poultry rearing. In order to encourage poultry rearing, Dr. Paulhus offered trophies for seven district winners. He also secured the offer of chicks by two large hatcheries for 1st and 2nd prize winners on a national contest basis.

Food and Nutrition:

736 members were enrolled in food projects. Food project work has created interest in improving stoves and kitchens and has encouraged club members to take regular responsibility in meat preparation and family baking. Some of the features demonstrated during 1960 were:-

- i) Use of local fruits (sorrell, jamoon, pine-apple and guave in simple cooked dessert);
- ii) Egg cookery;
- iii) Milk recipes from India;
- iv) Home made cheese to make use of surplus milk;
- v) Main dishes using peas and beans.

Much interest was evinced in the preparation of special products like jams, jellies and relishes, but the work was limited by lack of a cheap, easy source of bottles and lids.

Clothing:

913 girls were enrolled in clothing projects and they made a variety of garments. There were two Singer Sewing Machines Courses taught by representatives of the Singer Sewing Machine Company. Home Economics Field Assistants were equipped with portable sewing machines to use in demonstration work.

Achievement Days and Annual Exhibitions of Project Work were held as follows:-

- (i) Lusignan, East Demerara
- (ii) Skeldon, Berbice
- (iii) Bartica
- (iv) Essequibo Coast
- (v) Leguan
- (vi) Kumaka, North West District.

Each Achievement Day included an exhibition of individual project work, a public programme and district finals for Demonstration and Judging Contests.

Winning clubs of Achievement Day awards were as follows:-

- (i) Essequibo - Dartmouth, Riverstown
- (ii) Demerara - Soesdyke, Unity, Craig
- (iii) Leguan - Louisiana.

1960 was the second year Demonstration Contests were held. The categories in which each club was eligible to enter one demonstration were:-

- (i) Foods
- (ii) Clothing, and Inside Home Improvement.
Gardening, Crops and Outside Home Improvement,
Livestock and Poultry.

There were 93 contests in 1960. Winning Demonstrations from each district will compete at a colony wide contest . . proposed for April 1961.

Judging contests which were introduced in 1959 were continued. Each club was eligible to send two members for each type of judging. The categories listed for judging were:-

- Feeds
- Clothing, Gardening
- Livestock and Poultry.

There were 181 members in judging contests. In Berbice, the No. 48 Young Farmers' Club staged a very successful Tractor Rodeo. The Rodeo was arranged in two parts, skill events in the morning and ploughing in the afternoon. Results of the skill events were as follows:-

<u>Events</u>	<u>Sponsors</u>	<u>Winners</u>	<u>Awards</u>
Driving mounted harrow on narrow dam (Fordson Tractor)	Geddes Grant	F.D. Thompson	Sprayer
Driving I.H. Tractor and trailer zig-zag between line of barrel and reversing to start	Bookers	F.D. Thompson	Foot Pump
Speed contest of hitching plough to Ferguson Tractor	Sandbach Parker	Sookdeo Persaud	Tool Kit
Aligning a belt from David Brown Tractor to Water Pump	Sprostons	Sookdeo Persaud	Grease gun
Attaching plough to Nuffield Tractor and packing in garage	Sandbach Parker	Parran Singh	Head-lights.

The ploughing contest was sponsored by Messrs. Sandbach Parker and Company and Texaco Oil Company, and each contestant was responsible for bringing his own tractor. The results of this contest were as follows:-

First prize	-	Mr. Persaud
Second "	-	Mr. Ramdil
Third "	-	Mr. Gopie
Fourth "	-	Mr. Singh

The Grand Champion of the Rodeo was Mr. Sookdeo Persaud. He was presented a championship cup by Messrs. Shell Oil Co. This Rodeo attracted much interest and it is hoped to make it an annual event to encourage participation by other clubs.

The Youth Division prepared monthly leaflets to help local leaders and new leaflets on a number of subjects were also prepared for distribution. These were:-

- (i) Salad Skills
- (ii) Daily Harvest Record for vegetables
- (iii) Model Garden Plan
- (iv) Gardens for Health
- (v) Demonstration in Germination of seed
- (vi) Revised pig project reference material
- (vii) Supply of seeds and storing seeds
- (viii) Model programme for 4-H Club (a booklet)
- (ix) Revised poultry project reference material
- (x) Planning for Achievement Day
- (xi) B.G. 4-H Calendar for 1960
- (xii) Score sheets for Record Books.

The peasant sugar cane farming industry:

The Department of Agriculture has a special responsibility for cane farming for which the Cane Farming Officer is immediately responsible. The Agricultural Officer, East Demerara also serves as an ex-officio member of the Central Cane Farmers' Association.

In order to bring about a better understanding between peasant farmers and the sugar companies and also to stimulate interest in better husbandry, the following Field Days were arranged:-

- (i) La Bonne Intention Sugar Factory to demonstrate the method of weighing and testing farmers' cane.
- (ii) Mechanical cultivation to demonstrate the economical advantages of tractor ploughing and preparation of the land.
- (iii) British Guiana Sugar Experiment Station to acquaint farmers with the work of the Station, and to demonstrate new varieties, fertiliser trials and new agronomic techniques.

In spite of the advice by extension officers, peasant farmers persisted with the use of sulphate of ammonia as the sole fertiliser. Applications of 4 cwt. per acre whether to plant or ratoon canes appeared to be the general order. However, the East Demerara farmers were using the recommended variety B 41 - 227 for supplies or to renew their cultivation.

Main draingae and irrigation facilities left much to be desired in most villages. Unless the Local Authorities are prepared to deepen their trenches, there will always be

Achievement Days and Annual Exhibitions of Project Work were held as follows:-

- (i) Lusignan, East Demerara
- (ii) Skeldon, Berbice
- (iii) Bartica
- (iv) Essequibo Coast
- (v) Leguan
- (vi) Kumaka, North West District.

Each Achievement Day included an exhibition of individual project work, a public programme and district finals for Demonstration and Judging Contests.

Winning clubs of Achievement Day awards were as follows:-

- (i) Essequibo - Dartmouth, Riverstown
- (ii) Demerara - Soesdyke, Unity, Craig
- (iii) Leguan - Louisiana.

1960 was the second year Demonstration Contests were held. The categories in which each club was eligible to enter one demonstration were:-

- (i) Foods
- (ii) Clothing, and Inside Home Improvement.
Gardening, Crops and Outside Home Improvement,
Livestock and Poultry.

There were 93 contests in 1960. Winning Demonstrations from each district will compete at a colony wide contest . . . proposed for April 1961.

Judging contests which were introduced in 1959 were continued. Each club was eligible to send two members for each type of judging. The categories listed for judging were:-

- Feeds
- Clothing, Gardening
- Livestock and Poultry.

There were 181 members in judging contests. In Berbice, the No. 48 Young Farmers' Club staged a very successful Tractor Rodeo. The Rodeo was arranged in two parts, skill events in the morning and ploughing in the afternoon. Results of the skill events were as follows:-

<u>Events</u>	<u>Sponsors</u>	<u>Winners</u>	<u>Awards</u>
Driving mounted harrow on narrow dam (Fordson Tractor)	Geddes Grant	F.D. Thompson	Sprayer
Driving I.H. Tractor and trailer zig-zag between line of barrel and reversing to start.	Bookers	F.D. Thompson	Foot Pump
Speed contest of hitching plough to Ferguson Tractor	Sandbach Parker	Sookdeo Persaud	Tool Kit
Aligning a belt from David Brown Tractor to Water Pump	Sprostons	Sookdeo Persaud	Grease gun
Attaching plough to Nuffield Tractor and packing in garage	Sandbach Parker	Parran Singh	Head-lights.

The ploughing contest was sponsored by Messrs. Sandbach Parker and Company and Texaco Oil Company, and each contestant was responsible for bringing his own tractor. The results of this contest were as follows:-

First prize	-	Mr. Persaud
Second "	-	Mr. Randil
Third "	-	Mr. Gopie
Fourth "	-	Mr. Singh

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Main draingae and irrigation facilities left much to be desired in most villages. Unless the Local Authorities are prepared to deepen their trenches, there will always be

a source of dissatisfaction between the farmers and the sugar companies concerning the need for punts to transport cane to the factory. The shallow trenches do not permit for heavy loading of the punts, hence the need by peasant farmers for an unduly large number of punts for the transportation of their cane.

It is regrettable to note that no flood fallowing was done during 1960. The blocks organised for flood fallowing have been dis-organised by the farmers themselves, and it has now become a most difficult problem to get the farmers to re-organise for this most desirable practice.

Production of peasant farmers' cane for 1960 was as follows:-

<u>Area</u>	<u>Cane Produced</u> tons	<u>Value</u>
Berbice (including Lochaber)	23,692	\$235,498.48
East Demerara	57,812.6	495,480.69

The Spring crop cane was low in sucrose at the beginning of the harvest due to the end of year rains, but the quality improved as the harvest progressed. The prices paid peasant farmers were dependent on sucrose content and the Commonwealth Sugar Agreement but also varied according to variety. The reported prices varied as follows:-

(i) Spring Crop	-	\$8.39	-	\$9.76 per ton
(ii) Autumn Crop	-	\$9.35	-	10.26 " "

Beekeeping:

Apiaries, beekeepers and colonies increased as shown in the following table:-

TABLE XIX

of	Demerara	Berbice	Essequibo	Total	Increase over 1959
keepers	222	78	52	352	13
ies	251	86	58	395	34
ies	1,178	470	462	2,110	55

The Botanical Gardens Demonstration apiary was maintained in good condition, and continued to produce mated queens and nucleus hives for distribution to beekeepers. 99 queens and 53 nucleus hives were distributed during 1960. In addition, this apiary was also used for Demonstration and as a training centre for interested farmers, teachers and 4-H and Young Farmers' Club Members.

The Bee Officer maintained constant contact with schools and beekeepers through the Association and by visits to apiaries. In this connection it is of interest to note that beekeeping in primary schools is tending to receive more attention. There were 23 school apiaries in operation at year end.

453 visits were paid to beekeepers as compared with 325 in 1959. Due to lack of funds there was participation in only one Exhibition during the year. It should however be mentioned that beekeepers and schools exhibited at the Eastern Berbice Union of Local Authorities Exhibition and keen competition was evinced by the entrants.

Land Settlements

The Department of Agriculture is responsible for the technical planning and servicing of land settlements.

An Agricultural Officer stationed at headquarters coordinates this work and acts as liaison officer between the Department and the Land Development Department which is the agency concerned with the administration of all land settlements.

There are at present, seven agricultural land settlement schemes viz. Black Bush Polder, Mara, Garden of Eden, Cane Grove, Windsor Forest, Vergenoegen and Anna Regina. These involve a total area of about 50,000 acres. On the new land settlements e.g. Black Bush Polder it is the policy to allocate land on a leasehold basis to persons in need. The acreage allotted to each family is 15 acres for rice; on settlements based on citrus the allotment is 7 acres; for dairy farming it is 25 acres; for cacao - 10 acres.

It is also the policy of the Land Development Department to withdraw from a settlement as soon as it is fully established. A local authority takes its place and the area is serviced agriculturally by the Department of Agriculture. The first phase of this development took place at Cane Grove during the year. The following was the agricultural situation on land settlements in 1960.

Black Bush Polder

It is hoped to settle 1,500 families on the scheme which has been embanked and provided with drainage and irrigation facilities at a cost of some \$14 million. Settlement commenced during the year when 159 persons were chosen. 1,845 acres of rice which yielded 35,000 bags of paddy were cultivated. A further 63 persons were chosen in December.

Garden of Eden

54 settlers were selected for as many 7 acre plots on which citrus will be cultivated. Twenty three (23) other persons were chosen to occupy dairy farms of 25 acres each.

The Department of Agriculture established a demonstration citrus and dairy farm on 25 acres. This will be used as a training ground for settlers and as a nucleus for the supply of planting material particularly of recommended grasses.

Excellent initial crops of ground provisions were reaped by settlers during the year.

The unavailability of credit for settlers is proving the main hindrance to the rapid efficient development of this settlement.

Mara

This scheme is intended for rice, mixed food and fruit crops and for cacao. The soil, generally speaking, is of moderate fertility and requires good husbandry to produce economic yields.

Settlers showed great reluctance to cultivate cacao. Rice yields were low due to poor husbandry. A socio-economic enquiry into this scheme showed that settlers were making very poor progress due to a number of factors including:-

- (a) Absenteeism - many "settlers" continued to live away from their plots, in some cases their homes were 50 miles from the scheme.
- (b) Poor quality and agricultural experience of settlers.
- (c) Poverty - lack of capital (credit) for developing their holdings.

Cane Grove

Work on this scheme was concentrated on the production of pure line seed paddy for sale to the Department. The use of fertilisers was also demonstrated. The Land Development Department withdrew from this scheme. Until a Local Authority is formed, the Department of Agriculture assumed temporary custody of the coconut orchard, the dairy farms and the communal pastures. The condition of these projects left much room for improvement.

Anna Regina

Work by the Department of Agriculture on this rice settlement was concerned mainly with the production of pure line seed paddy. Settlers appeared to be totally indifferent to the production of any commodity except rice.

Vergenoegen

This is another rice settlement but settlers showed some interest in the production of food crops and in dairy farming.

In addition to these formal land settlements, the following land occupation projects received attention.

(a) Kumaka-Quehana Ridge

This area will eventually embrace 30,000 acres. Coconut is the main crop being sponsored but cacao, citrus and food crops will also be grown. Good progress has been maintained at the Department's demonstration plot. The work at this Station has tended, as it was hoped, to emphasise and highlight the necessity for proper soil conservation practices in the clearing of the forest growth and the subsequent utilisation of the land for crop cultivation.

A successful Field Day was conducted by the Field Assistant at which contouring, and other soil conservation practices were demonstrated and emphasised, and various aspects of crop husbandry were explained.

(b) Onverwagt

This area has been allotted for rice production. Selection of plot holders for unoccupied areas was carried out and at year end a total of 366 persons were on the land.

(c) Kortberadt - Zorg-en-Vlicht, East Bank Berbice

The applications for allocation of land on a co-operative basis for rice cultivation were considered by the Selection Committee on which the Agricultural Officer, Berbice served as a member, but actual allocation had not been made by year end.

(d) Tapacooma Project

This project will command 34,000 acres of land. The field survey by the Soils Division of the Department has been completed and the final report on the soils of the area has since been submitted.

(e) Vegetable Plots, Botanic Gardens

Twenty selections from 465 applications for quarter acre plots at the back of the Botanic Gardens were approved by the Hon. Minister and the selectees were allotted their holdings in the area which was formerly occupied by the poultry unit of the Livestock Farm. With the exception of four plots, very little was achieved by year end.

(f) Mauna-Yarakita, North West District

Plans for the utilisation of this area of some 20,000 acres for cocoa and cattle have been prepared. Provision of funds for the development of an initial 1,000 acres is awaited.

(g) Ordinance, Fort Lands, Corentyne, Berbice

A scheme for the development of this area of just over 200 acres for dairying and poultry, was prepared during 1959 but has had to be deferred indefinitely through difficulties being experienced in the provision of fresh water for the animals and for leaching of the soil for grass production.

VETERINARY SERVICES AND ANIMAL HUSBANDRY

Organisation

The Veterinary and Animal Husbandry Division is staffed by the Assistant Director (Veterinary), five Veterinary Officers with one or more Technical Assistants attached to each officer. There were two vacancies for Veterinary Officers throughout the year. The staff worked under severe pressure and had great difficulty in coping with all the requests for veterinary help. An early solution to the staff problem is of urgent importance to ensure adequate protection for and development of the livestock industry.

A Veterinary Officer was stationed at St. Ignatius Livestock Station for the Rupununi area, one at Central Agricultural Station for East Demerara and another at Georgetown for West Demerara. Two vacancies exist - one for a Veterinary Officer in Essequibo and another in Berbice.

The function of the Veterinary Officer in the district is to diagnose and treat animal diseases and to take measures to control and prevent the spread of infectious and contagious diseases. The main measures adopted are prophylactic inoculation, isolation, restriction of movement and the slaughter policy on occasions. Each district has a small laboratory and technical staff. In addition, the Field Assistants of the Extension Staff undertake the treatment of minor ailments, render assistance at parturition and first aid.

The Veterinary Officer also advises on animal husbandry and nutritional problems and is an integral part of the Extension Service on these matters.

The animal breeding policy of the Department is carried through by the Veterinary Division and a Veterinary Officer undertakes the direct supervision of the Central Agricultural Station's Stockfarm where the Department's dairy breeding stock are kept.

It is proposed, however, as soon as qualified staff is available to delegate all animal husbandry and animal breeding matters to trained animal husbandry men. A start in the establishment of this branch of the division has been made by appointment of subordinate technical staff who are responsible for working with the poultry and dairy industries. The dairy section has begun to compile records based on Artificial Insemination breeding. The aim is to produce herd records and to educate farmers to appreciate the value of such records. Progeny testing is envisaged at a later date.

The Artificial Insemination Service is centred on the Central Agricultural Station where the bulls are kept, and semen is collected, prepared and despatched to the districts. The Service operates on the whole of the coastal belt.

The poultry section is being developed along two lines. (1) The organisational aspect under which the industry is divided into broiler production, egg production, hatchery and marketing. Four committees representing these aspects have been appointed to advise the Department. The Department's poultry officer is secretary of these committees. (2) Pullorum testing has been introduced among breeding flock. Laboratory diagnostic services are also offered.

ANIMAL HEALTH

The main disease problem was again Paralytic Rabies which occurred both on the coastal belt and in the Rupununi Savannas. However, the incidence has been reducing since the introduction of a regular vaccination programme. The incidence is still high in younger stock perhaps because vaccinal immunity is not solidly conferred in calves.

Equine Encephalomyelitis

This disease occurred again in Berbice and was controlled by vaccination.

Other viral and bacterial diseases diagnosed include Newcastle, fowl pox, C.R.D., anthrax, swine erysipelas, tuberculosis, brucellosis, pullorum and mastitis.

Protozoal Diseases

Anaplasmosis and Piroplasmosis were regularly encountered and generally treated successfully.

Coccidiosis was widespread in poultry and occasionally encountered in young cattle particularly in the Rupununi district.

Parasites

Internal and external parasites were widespread in the coastal area. Lung worm was particularly evident at the Central Agricultural Station which was overstocked for a portion of the year. Treatment was generally successful using appropriate drugs.

Veterinary Research

Very little research work is undertaken due to limitation of staff.

The Liver Cirrhosis Problem on the Intermediate Savannas continued to be menacing at Waranama and Dubalay. Ebini was relatively unaffected.

Biopsy studies continued at Cambridge and the University College of the West Indies and locally by the Government Pathologist. Results of four quarterly biopsy studies revealed an apparent correlation between the rainfall distribution and incidence of fibrous tissue change seen on successive biopsies of individual animals. Affected animals seen late in the dry season and early rainy season, often recover clinically by the end of the rainy season and biopsies at this time show less evidence of cirrhosis. The Assistant Director (Veterinary) has prepared a paper on the work to date. The work is continuing. Crotalaria feeding trials have not revealed much information to date.

Laboratory and Clinical Services

The Division's laboratory and clinical diagnostic services were expanded and included work in Bacteriology, Parasitology, Biochemical analyses of animal tissues and other materials as well as milk examinations.

Veterinary Legislation

Considerable effort by the Veterinary staff was put into the drafting of a new Animal Diseases Ordinance to replace the 1936 Ordinance. The Draft Ordinance was framed to fit into the regional pattern of the British Caribbean Territories.

A separate Draft Veterinary Surgeons Ordinance was put up concurrently. This is intended to correct what is thought to be a misplacement of such legislation within the Animal Diseases Ordinance now in force.

ANIMAL HUSBANDRY

The Department's policy is to encourage Animal Husbandry and to foster livestock production. Some of the extension work in this field carried on by Veterinary and Agricultural Officers is described under "The Extension Service".

The three Livestock Stations at the Central Agricultural Station in Demerara, at Ebini on the Intermediate Savannas of Berbice and at St. Ignatius on the Rupununi Savannas were expanded. Ebini and St. Ignatius are concerned mainly with beef cattle.

Animal Breeding Policy

- Dairy Cattle i) Cross bred Friesian-Zebu (Sahiwal) to produce an animal suited to local conditions.
- ii) Selected $\frac{3}{4}$ bred bulls on the above cross breeds with subsequent selection for production and heat tolerance.
- iii) Imported pure bred Friesians to be selected on basis of heat tolerance and to be bred to (a) Bulls at (ii) and (b) Progeny tested Friesian bulls from

similar environment in the United States of America (Louisiana) by importation of frozen semen. A deep freeze semen cabinet is on order.

- Beef Cattle - Santa Gertrudis, Sahiwal Zebu } and crosses
Jamaican Brahman
- Pigs - Large White (Yorkshires) Landrace and crosses.
- Sheep - Improvement of local mutton types experimenting with Border Leicester crosses and Barbados Black Belly.
- Goats - British Alpine.
- Chickens - (for eggs) Rhode Island Reds and White Leghorns.

The Livestock Industry is served by the Artificial Insemination Service for dairy cattle; by the sale of bulls from the Ebini and St. Ignatius Stations and by the sale of breeding stock of all the other types of livestock maintained. A hatchery for chicks is operated at the Central Agricultural Station.

LIVESTOCK FARM (Central Agricultural Station)

Cattle

A shipment of 70 Friesian heifers was received from the United States of America. There were 1 to 3 months of age. They have been doing quite well. A new building was constructed to house these animals and construction begun on a milking parlour adjacent to the new pen.

A total of 193 cattle was maintained on the Livestock Farm comprising 21 bulls, 63 cows and 109 calves.

Due to severe drought conditions the station was short of grass and drastic reduction was made by culling and sale of stock to dairy farmers at public auction.

The Dairy Heifer Scheme herd was reduced from 455 to 250 heifers and cows. Besides sales, 26 in-calf heifers were distributed under the revolving heifer scheme.

Horses

There were 5 horses on the station during the year kept mainly for transportation during wet weather.

Donkeys are used for hauling carts about the station. Five donkeys, two males and three females were on the station at year end.

Sheep

The number of sheep on the station at year end was 60. Lambs born for the year numbered 48. 14 rams were distributed for the year. The herd was culled and 63 animals sold for slaughter.

Goats

Seven bucks were sold to farmers during the year as breeding stock. At year end there were 19 goats on the Farm. The herd was culled - 13 animals were sold for slaughter.

Pigs

Breeding stock of the Large White and Large Black breeds distributed for 1960 numbered 182. At year end the total stood at 115.

The Department imported sixteen pure-bred boars and gilts of the Yorkshire or Large White and Landrace breeds, while the Demerara Bauxite Company made a similar importation of twelve pigs. There is every indication that there will be many more pigs available in 1961, since the Department alone will have for breeding approximately forty sows. (twice 1959's figure).

Poultry

The flock of Rhode Island Reds and Leghorn at year end totalled 1,417 made up by 1,251 pullets, hens and cockerels and 266 chicks (replacements). 163,448 eggs were produced of which 49,924 were incubated. 28,273 chicks were distributed in the districts.

EBINI LIVESTOCK STATION

Conditions generally for 1960 were much better than the previous year with consequent improvement in growth of grass, condition of cattle, reproductive performance etc., giving evidence to the fact that there is considerable difference in responses on these marginal savanna lands when only slight changes in rainfall and other factors limit performances considerably.

The Pastures

Pangola continues to thrive. 60 additional acres were planted. The organic matter on these pastures appears to be building up nicely.

Pensacola Bahia has done quite well and is quite palatable.

New strains of Coastal Bermuda and other species of Digitaria from the Imperial College of Tropical Agriculture did not survive. Alfalfa has been given a further trial.

Efforts to plant shade trees have been hindered by interference from livestock. This is being overcome to some extent by planting trees in small baskets in a nursery and growing the plants to about 8 feet when the younger shoots are out of reach of the cattle. The whole basket is then planted allowing minimum disturbance of the plant. The species include Samaan, Peltophsium, Caesalpinia and Haucijuga.

Livestock

The cattle totalled 1,023 and comprised 24 bulls, 644 cows, 19 heifers, 90 steers and 246 calves. The calf crop for 1960 was 280 with 22 still births.

The breeding policy continued to be grading up of the original cattle with Santa Gertrudis and Sahiwal Zebu bulls in single sire units as well as breeding pure strains of the two breeds. During August, new breeding stock including 10 Santa Gertrudis Heifers and 2 bulls along with 2 Red Brahman Bulls and 4 Red Brahman heifers were imported from the United States of America. One White American Brahman bull and two heifers were also introduced.

The Santa Gertrudis heifers are to augment the pure-bred herd and to hasten production of pure bred stock; the Santa Gertrudis bulls are to be used to avoid inbreeding in the herd. The original bulls were imported in 1954.

It is most difficult to obtain new Sahiwals so that Red Brahmans which somewhat resemble the Sahiwals have been brought in.

Calf weights were much better than in previous years. The weight at 360 days was 460 lbs. compared with 381.1 lbs. in 1959 and 416.3 lbs. in 1957.

Of calves born in 1957 and 1958 males were heavier than females at birth and this difference in weight increased steadily up till 360 days. This is not so for 1959 where it is only from 200 days onwards that the males are heavier. There was more illness and deaths among males which probably accounts for the difference.

The calving intervals have got much shorter during 1960 for many cows.

Experiments in Progress

Steer Grazing Trial II on Pangola grass begun July 1959 and concluded April 1960

Sixty-four (64) steers with an age range nine months to 21 months were rotationally grazed over seven ten-acre pastures - an eight 10 acre plot being added late in the experiment, and the animals were moved every $3\frac{1}{2}$ days. When grazing was not thorough another herd followed on these pastures (more so for wet weather). A number of the unknown sired steers were slaughtered at Ebini.

The Table below shows particulars and performance of steers by the known and more important sires.

TABLE XX

Sire	No. of Steers	Av. Age 1st July 1959	Mean Weights		Liveweight gain lb/day
			1st July 1959	20th April 1960	
Santa Gertrudis 2	4	320 days	377.3	657.3	0.93
177	7	1 yr. 107 "	477.6	753.6	0.92
182	9	1 " 78 "	359.1	648.2	0.96
200	8	1 " 155 "	595.9	860.3	0.88
Sahiwal	35	1 " 88 "	419.6	682.2	0.87

The progeny of Santa Gertrudis 182 were lighter at the start than those of Sahiwal 35; the two groups were of approximately the same age and both groups were range bred. Those of Santa Gertrudis 2 were young at the start, they had not been reared under ideal conditions - rather poor Bahai pastures - yet they were heavier than the Santa Gertrudis 182 stock.

There were inadequate numbers of steers for a similar trial in January 1960. Only forty-three (43) steers were available in July 1960. The same eight pastures were

used as in Grazing Trial II. A breeding herd was again used as a 'Clean up' group on these pastures when not closely enough grazed. Generally the growth has not been as good as in Trial II and the numbers are not sufficient for valid comparisons of progeny groups.

Trace Element Experiment - begun October 1959

A mineral feeding experiment was begun October 1959. This is being done on planted pastures. In-calf cows and heifers are the experimental animals. The cattle are rotationally grazed on eight-8½ acre pastures, which had complete fertiliser in August and September and which were fertilised periodically throughout the experiment.

The Treatments are:-

- (1) Control - no supplement
- (2) 1.3 oz. per day of Churns Protective High Phosphorus mixture
- (3) Copper, cobalt, zinc and molybdenum
- (4) Cobalt, zinc, molybdenum - no copper
- (5) Copper, zinc, molybdenum - no cobalt
- (6) Copper, cobalt, molybdenum - no zinc
- (7) Copper, cobalt, zinc - no molybdenum.

The experiment concluded in May 1960. By this date only half of the number of cows and heifers had calved and many were evidently not in-calf making this experiment incomplete but it did provide some information:-

(1) In all groups, the calves did better and the dams lost less weight than in the control where 2 calves out of 3 died and the dams of these calves continued to lose weight right up till the end of the experiment, long after the death of the calves.

(2) In group (2), the growth rate of calves was good - better than in any other group and the cows lost less weight after calving than those in other groups. For the first 100 days, three calves gave a mean daily live weight gain of 1.84 lb. per day, their dams lost 0.4 lb. per day during the same period. Animals not calving showed live-weight gains ranging from 85 - 244 lb. for the period October to May. All other groups showed signs of phosphate deficiency and this may have been a limiting factor; quite different responses to the trace elements may have been obtained with higher phosphate intake.

(3) Group (5) did badly. The four calves had an average daily liveweight gain of 0.75 lb. for the first 100 days. The loss of weight in their dams for this period ranged from 0.74 to 2.14 lb. per day, the mean being 1.4 lb. Of the four animals which did not calve, one gained 53 lb., one remained at constant weight and two lost 127 and 191 lb. respectively.

(4) The other trace elements, copper, zinc and molybdenum gave less marked responses. Those receiving no copper appeared to do better than those that did whereas there seemed to be a slight response to both zinc and molybdenum.

(5) There was great individual variation in response within groups. This appears to be due to the past history of the animal. It appears that animals which were on range with access to trace elemented bone flour before the experiment were better able to withstand phosphate deficiency than those that had been on fertilised pastures without the Churns Protective High Phosphorus mixture. The latter, at the beginning of the experiment were in much better condition and had grown more rapidly than the range animal.

Liver Cirrhosis Investigations

See preceding section on Veterinary Research.

ST. IGNATIUS LIVESTOCK STATION

The Station is run by an Agronomist assisted by a Veterinary Officer.

Rainfall

The rainfall was higher (67.21") than in 1959 (59.91") but more adversely distributed. Extensive flooding occurred in July, while the period from August to December was exceptionally dry.

The Programme

An attempt was made to finish off developmental work and increase research work.

Construction

A new office and laboratory were completed at St. Ignatius also new calf shed, corrals, propagation shed and corn store. Work was completed on the dipping tank. Outstation corrals buildings were built or repaired. Twenty miles of fencing were completed and several small paddocks made.

Breeding Policy

Santa Gertrudis and Brahman (American and Jamaican) are used to grade up the original cattle.

A single sire Santa Gertrudis herd has been formed and all the females are at least F 1 crosses.

Nine single sire Brahman units have been set up including a pure bred unit - the females having been imported from the United States of America.

Loan of Bulls to Ranchers

Five pure bred Brahman bulls and one pure bred Santa Gertrudis bull are to be offered to local ranchers on loan under certain specified conditions regarding husbandry, limitation on use etc. for a period of one year.

Cattle

The year began with the total cattle population at 512 and this figure reached 564 by mid-year. Culling was undertaken and the herd reduced below 400. By the end of the year, the total was up to 473 which included twenty eight (28) imported Brahman bulls and heifers from the Southern United States of America. Ninety-three (93) calves were born during the year, forty-two (42) Brahman crossbreds and fifty-one (51) Santa Gertrudis crossbreds. Seventy-two (72) of these were born during the rainy season (April - August) showing that most of the females conceived at the end of the wet season or early dry season. Mean weight for all calves was 67.4 lbs. 1959 calves which were yearlings weighed 355.5 lbs. average. From a mean liveweight of 61.7 lbs. this gave a mean daily liveweight gain of 0.77 lbs./day.

Calves born in the wet season were heavier at birth and also at 12 months. This is probably due to the improved condition of pastures and likewise the dams milk production at this period.

Difference Among Breeds

Yearling Brahman offspring again did better than those of the Santa Gertrudis.

Calving Interval

For 70 cows the calving interval gives an average of 649 days. The minimum was 335 days and the maximum 1,251 days.

The Savannas

A rotational grazing trial which was set up on 3 - 50 acre paddocks for controlled grazing studies on Trachypogon/Andropogon association was abandoned after malicious burning of the savanna which completely destroyed the grass cover.

A series of plots which were laid down for the purpose of observing the effects of fertilising the savanna grasses were destroyed in the above malicious burning.

Other work ruined included trials laid down for controlled burning.

Grasses

Seven species of grasses were maintained on $\frac{1}{2}$ acre plots:-

- | | |
|---------------------|--------------------------------|
| 1. Pangola grass | Digitaria decumbens |
| 2. Wynne grass | Melinis minutiflora |
| 3. Guinea grass | Panicum maximum |
| 4. Jaragua grass | Hyparhenia rufa |
| 5. Makarikari grass | Panicum coloratum var makarika |
| 6. Bahai grass | Paspalum notatum |
| 7. Rhodes grass | Chloris gayana |

Pangola

Slightly more than 100 acres of pangola exist on the station - even though it ceases to grow at the end of the rainy season - and goes back in the dry season, it is still the most promising of the introduced species.

A good deal of investigation was done to determine the best way to plant pangola. This included:-

- (1) Deep plowing versus shallow (disc harrow) versus rotivation.
- (2) Effect of planting distance.
- (3) Effects of fertilisers at the term of planting.

Livestock Research

A small experimental herd was established close to the station. These animals receive no treatments (mineral supplements, anthelmintic). They are checked bi-monthly for weight, ovarian activity (by rectal palpation) faecal worm output of calves, status of udder and blood mineral levels. Some observations have been made:-

- (1) Growth rate of calves is poor and variable.
- (2) High fecal egg counts are recorded in calves very early in life e.g. 28 days old. Older animals show very low counts.
- (3) Duration of lactation of cows averaged 342 days.
- (4) Contrary to local belief 4 of 14 cows became pregnant while still suckling their calves.

FISHERIES DIVISION

The Division of Fisheries is organised in two sections, that of Research and of Extension.

1. - Research

The Research Section was staffed by the Fishery Research Officer, the Hon. Fishery Research Officer (Dr. Rosemary Lowe McConnell) and supporting technical and clerical staff.

Fish Hatchery and Experiment Station, Botanic Gardens

Ponds at this Station are used as a source of supply for fresh water fish. This hatchery has provided some 215,000 Tilapia for distribution to ponds in the colony.

Onverwagt Fish Culture Station

This brackish water station was completed during the year when a total of 57 acres of pond space was established. The ponds were stocked with mullet, croaker, snook, tarpon, bashaw, grouper, tilapia and shrimp. Studies were conducted on:-

- (1) the occurrence and abundance at particular spawning periods
- (2) conditions of spawning.
- (3) conditions for raising fry
- (4) enemies of the fry and their control and avoidance
- (5) food habits of fry.
- (6) rate of growth and optimum cropping age.

Water studies were also in progress and were concerned with such matters as salinity, pH, oxygen content, sedimentation temperature, evaporation and water loss. Biological studies on plankton were also pursued.

A special investigation was carried out on the growth of shrimp Penaeus schmitti and Penaeus aztecus. This involved collection of the pre-adult and larval shrimp and their growth to 8 or 9 inches after a period of seven or eight months.

A film on the activities of this Station was prepared by the Government Information Services. Several field days were held at the Station.

Gear

A single beam trawl was constructed and tested.

Fish Preservation

The production of fish meal from surplus fish was attempted at the Processing Factory. Both the quality of fish and the fact that suitable equipment was not used resulted in a product of low quality.

Bait Shrimp preservation

Following work in the laboratory, some 4,000 pounds of bait shrimp preserved in brine/formalin were prepared by the Bagotstown Fishermens' Co-operative Society and exported to the United States of America.

Manatees

The use of the Manatee for clearing ditches of weed which was demonstrated by the Division, earned a great deal of publicity in popular (e.g. 'Times') and scientific journals abroad. A large number of requests were received for manatees both locally and from foreign countries.

Fundamental Studies

The Hon. Fishery Research Officer devoted considerable effort and time locally at the British Museum and other Institutions abroad completing the identification and description of the fishes found in coastal waters. The results of this work will be published.

Biological Research Institute

The possibility of establishing a Biological Research Institute in the colony was examined by the Fishery Research Officer and the Hon. Fisheries Research Officer. The project appeared feasible and a local Steering Committee was set up to explore avenues of financial support. The Government agreed to donate a plot of land on which the building would be erected.

ii - Extension

The I.C.A. provided the services of an experienced Fisheries Specialist to assist the Division in its work. The Specialist made a survey of the local industry and submitted recommendations for development and improvement. Some of these recommendations were implemented e.g. re-organisation of handling methods at the Wholesale Fish Market which has reduced losses at the Market.

The advisory Committee for the fishing Industry held several meetings and dealt with a wide range of matters of importance. These included the fixing of buying prices at the Fish Market, the policy for the sale of fish caught by shrimp trawlers, the supply of fish to Government Institutions and the Fisheries Ordinance.

Statistics relating to the Industry were collected by the Extension Division.

The refunding of duty paid on imported fishing supplies occupied a great deal of the time of Officers of the Division. A total of \$39,986.08 was refunded.

Two Co-operative societies were organised, thus bringing the total number to eleven (11).

MARKETING DIVISION

Policy

The general policy of the Division remained unchanged, namely, encouraging local agricultural production by offering producers an assured market, paying economic prices and organising distribution of supplies to consumers, at fair prices throughout the coastal areas.

The following services were operated by the Marketing Division:-

- I. Government Produce Depots (2)
- II. Processing Factory
- III. Ham & Bacon Factory
- IV. Fish Market & Centre.

A total of 124 persons was regularly employed in various capacities during the year.

Government accepted the policy recommended by the Director of Agriculture and supported by other authorities including the Agricultural Adviser to the Secretary of State for the Colonies that the Marketing Division should be separated from the Department of Agriculture. Government will create a Marketing Department in the Ministry of Trade to which the Marketing Division will be transferred.

GOVERNMENT PRODUCE DEPOTS

The Depot maintained centres for purchasing farmers' produce at Charity and Diamond (Pomeroon), Parika (West Demerara), New Amsterdam (Berbice) and Georgetown. Purchasing in the North West District was carried out by the Farmers' Co-operative Society. With the exception of New Amsterdam and Georgetown which operated on a wholetime basis, the centres were visited weekly by Marketing Assistants on such days as the Government steamer made its call. Sailing vessels were also extensively used to supplement the Government steamer service in the conveyance of produce from the Pomeroon area to Georgetown.

By the nature of its operational policy, farm produce sold to the Depot represents supplies surplus to the requirements of private traders.

Despite increased exports to the West Indies, supplies of plantains to the Depot exceeded the 1959 purchases by over one million pounds. Disposal of this surplus presented quite a problem but a sizeable outlet in the Berbice area was created by limiting imports from Surinam. Cassava showed a further decline. Disposal was effected mainly through peasant producers of starch, but at approximately half a cent below cost. Sweet Potatoes increased sharply, main source of supply being the Berbice River district. Unfortunately, due to heavy pest infestation, much of this crop became unmarketable due to early deterioration, and this resulted in considerable financial loss to the Division. Supplies of other ground provisions were below requirements, particularly so Yams.

Following is a comparative breakdown of the purchases of Ground Provisions in 1958, 1959 and 1960:-

	1958 (lbs)	1959 (lbs)	1960 (lbs)
Plantains	5,487,324	1,858,684	2,893,122
Cassava	5,208,705	2,029,889	1,532,049
Sweet Potatoes	83,290	108,496	122,796
Yams	25,855	50,424	36,263
Tannias	4,642	6,363	9,761
Eddoes	136,715	71,368	102,119
	10,946,531	4,125,224	4,696,110

Coffee and Cocoa Beans

Only 25,171 lbs. of Coffee Beans and 15,367 lbs. of Cocoa Beans were purchased during the year. The general quality of Cocoa Beans offered the Division was disappointing and showed little or no effort at proper preparation. The Department has decided to set up Central fermentaries in the main producing areas to which farmers will take their pods for processing. There was definite improvement in the quality of Coffee Beans produced and prepared for export and this factor alone made export possible on a falling and therefore selective market. The Division continued to act as an export clearing house for the North West District and Pomeroun Farmers Co-operative Societies respectively. Exports totalling 199,924 lbs. were made, principally to Holland.

Fruit

Supplies of bananas were well maintained, due mainly to increased production in the Demerara riverain areas. Citrus fruit showed marked increases, but here again little attention was given to selectivity or grading, a factor which has militated against favourable price levels.

	1958	1959	1960
Bananas	49,552 lbs.	27,230 lbs.	39,520 lbs.
Oranges	51,467 only	83,516 only	91,370 only
Grapefruit	15,748 "	14,682 "	34,880 "

Livestock Feeds, Veterinary Supplies, Insecticides and Fertilizers

The Produce Depots continued to provide a valuable service to the farming community by the sale of these commodities, particularly so in the more remote areas.

PROCESSING FACTORY

The Factory manufactured a full range of balanced feeds for poultry, cattle, pigs and horses. Over-all production showed an increase of 220,952 lbs. over the previous year, despite a decrease of 93,700 lbs. in the sale of poultry feeds which experienced heavy competition from imported feeds. Substantial increases were recorded in pig feeds (230,237lbs.) calf meal (50,450 lbs.) and dairy meal (40,665 lbs.). Production of mixed

feeds was 1,089,752 lbs. compared with 868,800 lbs. in 1959 and 959,225 lbs. in 1958. A comparative statement of feeds produced is given below:-

	<u>1958</u> (lbs.)	<u>1959</u> (lbs.)	<u>1960</u> (lbs.)
Chick Starter	33,360	35,000	4,000
Growing Mash	37,758	51,900	50,250
Layers Mash	134,990	82,750	39,450
Breeders Mash	52,300	71,200	53,450
Dairy Meal	329,307	372,245	412,910
Calf Meal	61,750	48,200	98,650
Pig Starter	42,000	34,925	63,000
Pig Grower	103,609	83,150	136,293
Pig Finisher	16,700	14,400	38,789
Sow Ration	92,700	46,950	166,700
Horse Feed	33,050	17,300	10,600
Weaner Ration	<u>21,701</u>	<u>10,780</u>	<u>15,660</u>
	959,225	868,800	1,089,752

Corn

The factory, by virtue of its policy, continued the purchase of farmers corn at the Government guaranteed price of 4½¢ on spot. Purchases for the year amounted to 1,671,695 lbs., an increase of 437,321 lbs. on the previous year's purchases. Farmers' failure to dry their corn properly again caused undue loss by shrinkage in the subsequent process of mechanical drying. To offset this, a limit of 14% moisture content was fixed for the autumn crop and any excess was deducted pro rata from the weight. In addition it was also necessary to reject corn which was obviously not properly dried.

Disposal of a large surplus of this purchase is proving a problem for the reason that local processors of mixed feeds are apparently carrying heavy stocks, and export is only possible at considerable loss due to competition from sources where grain is known to be heavily subsidised. A shipment of 76 tons of crushed corn was made to the West Indies under these conditions.

Corn Meal

The Factory is presently supplying all of the Colony's requirements of this product. Comments on the quality of our corn meal have been very favourable, so much so that increased demand to the extent of 57,504 lbs. has had to be met for the year under review. Total production amounted to 302,977 lbs. as against 245,473 lbs. in 1959 and 104,407 lbs. in 1958.

Plantain Flour

Manufacture of Plantain Flour was again undertaken as a means of relieving the heavy glut of plantains. Production for the year amounted to 30,804 lbs. against 26,465 lbs. in 1959. Increased demand for this product is attributed mainly to attractive packaging for the supermarket trade.

A trial shipment of one ton was made to the U.K. in December, and it is hoped that a favourable trade in this commodity will result from this initial effort if it proves satisfactory.

HAM AND BACON FACTORY

While the Factory can definitely be stated to have greatly benefitted the local Pig Industry in that it provided an assured market for pigs of improved breed, economic operation was militated against by the continued shortage of pigs of suitable quality, resulting in increased price demands, and still more so by competition from imports of bacon dumped on the local market at exceptionally low prices. Much of these cheap imports originated in countries in which the pig industry is known to be heavily subsidised. Some idea of the effect of this on the Factory's economy may be gathered from the fact that merchants were able to retail this type of imported bacon cheaper than it could be produced locally. Enforced reduction in the Factory's selling prices to meet this unfair competition has resulted in the present unfavourable position.

A total of 1,258 pigs weighing 129,928 lbs. was purchased for \$74,310.77; an average price of 57.2¢ per lb. The average price paid in the previous year was 54½¢ per lb.

A comparison of Finished Products production for 1958 - 1960 is given hereunder:-

	<u>1960</u>	<u>1959</u>	<u>1958</u>
Ham	10,773 lbs.	8,752 lbs.	9,026 lbs.
Bacon	23,775 "	27,475 "	48,342 "
Sausages	3,980 "	3,816 "	8,500 "
Lard	5,501	4,066 "	7,568

FISH MARKETING CENTRE

The Centre provides facilities for the orderly marketing of fish either by the fishermen themselves or by sale to the Wholesale Fish Market which is operated by the Marketing Division.

Other services provided by the Centre include the storage of fish for fishermen and vendors; the sale of ice (in blocks or crushed) at a subsidised price; the running of a dormitory, for the use of which a very nominal charge is made to fishermen; net drying and tar-dipping facilities; a ramp and grid for boat repairs; piped water and the sale of gasoline and oils.

The Wholesale Fish Market handled 552,036 lbs. of fish valued at \$233,591.54. The main types were Snapper, Queriman, Grouper, Snook, Bashaw, Grey Snapper, Croakers, Sea Patwa and Banga Maree.

The volume handled represents a decrease of 113,344 lbs. on the previous year's operations. Explanation for this is to be found in the increased landings at privately owned wharves and the fact that owners of deep-sea vessels readily obtained higher prices for their type of fish (snapper) by direct sale to dealers in times of scarcity, but in the glut periods the Market was required to purchase their surplus catches. These unbalanced conditions of trade operated adversely on the economy of the Market to such an extent that it eventually became necessary to call on the owners of vessels to enter into an agreement to sell their catches to the Market at all times under certain conditions of purchase. Failure to enter into this agreement automatically relieved the Market of the obligation to purchase catches from the dissenting vessels in periods of glut.

The lack of efficient and adequate Cold Storage facilities continued to negative successful operation of the Market. Stabilization of fish supplies was impracticable and gluts were frequent and in some cases embarrassingly heavy. These unfavourable conditions compelled heavy losses, not only from spoilage, but also from enforced immediate disposals at sub-normal profit margins and sometimes at uneconomic price levels.

It has become clear and, indeed, indisputable that the successful operation of the Wholesale Fish Market and of the local fishing industry as a whole is entirely dependent on the provisions of adequate and efficient cold storage facilities. To this end it is gratifying to be able to report that under the guidance of the recently appointed I.C.A. Fisheries Adviser, experiments in the liquid storage of fish have been carried out with a marked degree of success, and steps are being taken to expand storage accommodation in this respect.

Provision has been made in the Development Programme for the extension of cold storage facilities, and it is hoped also to be able to carry out extensive modifications of existing plant and equipment within the limits of this provision.

MILK PASTEURISATION PLANT

Purchases by the Milk Pasteurisation Plant increased to 622,262 gallons from 498,876 gallons in 1959. Not all this milk was sold owing to consumers' traditional preference for imported processed milk. Actually sales amounted to 534,520 gallons comprising 365,680 gallons of plain pasteurised milk and 168,840 gallons of chocolate milk. The quantity of milk distributed, free of charge to public Institutions, schools and charitable organisations was 71,925 gallons.

AGRICULTURAL ECONOMICS DIVISION

Agricultural Census

Preparation for the 1961 Agricultural Census commenced during the year. Two statistical assistants were placed at the Lands and Mines Department, and the Registry for the purpose of compiling a classified record of lands of the colony in the various forms of tenure. Other preparatory work for the census was also undertaken.

Stocktaking of Agriculture

In view of the long intervals between agricultural census censuses, an annual stocktaking of agriculture was initiated. The main objective of the operation is to provide estimates on a village to village basis, it is intended that the extension staff with the co-operation of other rural agencies and estate proprietors would collect statistics on crop acreages, production and livestock numbers. The statistics are recorded on a return showing crop acreages under cultivation and the production thereof during the year.

Statistical Abstract

The Division was actively engaged during the greater part of the year in the preparation of an Agricultural Statistical Abstract. Preparation of this abstract was begun by the former Agricultural Economist. The data was thoroughly revised in the light of new information and brought up to date.

Research

A brief survey was made in respect to the economics involved in 15 acre rice holdings. Another brief survey was made in respect of the Cost of Production of Milk.

Agricultural Credit

A section was created to introduce a supervised credit programme for Land Settlements. Farm plans were prepared with the farmer and submitted through the Division to the B.G. Credit Corporation. During the year 20 plans were submitted with a total credit requirement of about \$60,000.

BOTANIC GARDENS

The Gardens were kept in an attractive condition during the year.

The work of bringing in and planting up of the ex-Rice Lands continued.

A considerable amount of work on permanent all weather roads was done, and a number of concrete bridges of a permanent nature constructed.

Floral decorations at official celebrations continued to be a feature of the work of the Gardens Staff which invariably attracts the attention of the Public. A number of such decorations were done as for instance on the occasion of the visit of H.R.H., the Princess Royal and the Queen's Birthday, and other such occasions.

The Gardens continued to offer vegetable seeds for sale and economic plants and ornamental plants as well, with the exception of cacao, coffee and citrus. Sales were:-

Seeds

Mixed vegetable seeds	22,638 packets
Tomato seeds	2,536 "
Onion seeds	362 "
Cauliflower seeds	256 "
Selected Black Eye Peas	932½ pounds

Plants

Economic plants	3,760
Ornamental plants	6,735

PLANT PROTECTION SERVICE

The Plant Protection Service continued the inspection and examination of Plants and plant products imported into and exported from the Colony.

The table below gives the number of items examined during 1960:-

<u>Imports</u>	<u>Amounts</u>
Chick Peas	5,532 bags
Garlic	13,697 crates
Black Eye Beans	5,100 bags

<u>Imports</u>	<u>Amount</u>
Coriander seeds	514 bags
Mustard seed	148 "
Canary seed	1,053 " , 9 ctns, 1 drum, 1 case
Fenugreek seed	27 "
Ginger	145 "
Sugar Cane Fuzz	13 boxes
Cummin seed	453 bags
Budzingar mixture	202 " , 16 ctns.
Red Beans	111 "
Green Peas	113 "
Flower seeds	327 Packages
Vegetable seeds & Bulbs.	224 "
Cocoa Beans	18 "
Green Vegetables	19,367 "
Fruit	19,824 "
Fennel seeds	49 "
Aniseed	23 "
Green Peas	160 "
White Beans	6 "
Ornamental Plants	104 "
Economic Plants	153 "
Millet seeds	20 "
Xmas Trees	185 "

EXPORTS

Flowers, Seeds, Bulbs	145 Packages
Vegetables	575 "
Fruit	43 "
Sugar Cane Fuzz	1 "
Peanuts	100 "

METEOROLOGICAL DIVISION

Records of atmospheric pressure, temperature humidity, sunshine, radiation-temperature, rainfall evaporation, and velocity of wind were taken at the Botanic Gardens, Georgetown; temperature, humidity and rainfall at New Amsterdam Gardens, Hosororo Experimental Station, North West District, 72 miles Bartica-Potaro Road, and St. Ignatius, Rupununi; temperature, humidity, sunshine and rainfall at Anna Regina, Essequibo, and Mazaruni Prisons; records of atmospheric pressure, temperature, rainfall and velocity of wind at Mabaruma, North West District; temperature, humidity, rainfall and velocity of wind Lethem, Rupununi, and Enachu, Mazaruni.

Rainfall Records were also taken at 68 Stations situated within 15 miles from the coast viz: 19 in Berbice, 41 in Demerara and 8 in Essequibo, and 29 stations situated more than 15 miles from the coast.

Observations at the various stations are under the supervision of the following:-

Botanic Gardens:	Meteorological Observer and Assistants;
New Amsterdam Gardens:	The Agricultural Officer;
Anna Regina, Essequibo	The Post Master;
Hosororo Experimental Station:	The Agricultural Officer;

72 Miles Bartica-
Potaro Road:
Mazaruni Prisons:
Mabaruma:

St. Ignatius Experiment
Station
Lethem, Rupununi
Enachu, Mazaruni

An officer of the Public
Works Department;
Two officers of the Prisons
Department;
An Officer of the Tele-
communications
Department;
The Agricultural Officer;
An Officer of the Postal
Department;
An Officer of the Tele-
communications
Department.

Close contact was maintained with the Director of the West Indies Meteorological Service, Trinidad, to whom monthly reports are sent. The Director and Staff gave technical advice and undertook the adjustments of instruments.

Weather

Reports are sent twice daily by radio to the head-quarters in Trinidad and a daily weather forecast for the George-town area is publicised by radio and newspaper.

SECTION III

LEGISLATION

Summary of Legislation affecting Agriculture
Enacted during 1960.

Orders in Council

Purpose

- | | |
|--|---|
| 1. Animals Diseases (Prohibition of Importation) | To revoke Animals' Diseases (Prohibition of Importation) Order No. 2 of 1956. |
|--|---|

SECTION IV

(1) BOARDS AND COMMITTEES - 1960

The Director of Agriculture served as Chairman of the following Boards and Committees:-

- (1) Sugar Industry Price Stabilisation and Rehabilitation Funds Committee;
- (2) Sugar Experiment Station's Committee;
- (3) Marketing Committee;
- (4) Ad Hoc Fisheries Advisory Committee
- (5) B.G. Rice Development Company.
- (6) Steering Committee for the establishment of a Biological Research Institute.

The Director also served as a member of the following Committees:-

- (1) British Guiana Rice Marketing Board.
- (2) British Guiana Rice Marketing Board - Executive Committee;
- (3) Selection Committee for I.C.T.A. Scholars.
- (4) Davson Memorial Fund Committee
- (5) Museum Committee (Board of Trustees for the Georgetown Cultural Centre);
- (6) Rice Producers' Association.

The Director attended the following meetings outside the Colony:-

FAO Consultative Sub-Committee on the Economic Aspects of Rice - Vietnam (Elected Vice Chairman).

Natural Resources Council - Trinidad.

Eastern Caribbean Farm Institute - Board of Governors Meeting - Trinidad.

Official Standing Committee on Agriculture, Fisheries, Forestry and Livestock - Antigua.

Rice Conference - Trinidad.

During August the Director of Agriculture visited the Sugar Cane Breeding Station in Barbados.

(ii) SENIOR STAFF CHANGES

The following changes of staff occurred during 1960:

Appointments

P.A. Chan Choong	-	Deputy Director
E.I. Hugh	-	Assistant Director (Extension)
E.M. McWatt	-	Assistant Director (Veterinary)
P. Poonai	-	Economic Botanist
A.R. Baburam	-	Agricultural Officer
M. Ramnaraine	-	Agricultural Officer
B.W. Carter	-	Agricultural Officer
B.H. Samaroo	-	Agricultural Assistant
M.V.A. Spencer	-	Executive Officer
H. Timla	-	Assistant Accountant
L.L. Rai	-	Senior Field Assistant(Temp)

(iii) Senior Staff as at 31st December, 1960

Director of Agriculture	G.B. Kennard, D.I.C.T.A., A.I.C.T.A., Dip. Agric. Econ.
Deputy Director of Agriculture	P.A. Chan Choong, B.Sc.(Hons) (Lond.) A.I.C.T.A.

RESEARCH AND LABORATORIES

Assistant Director (Research)	H. Paul, B. Sc., M. Sc. (McGill), Ph. D (Lond.), D.I.C., F.R.I.C.
Chemist	N. Ahmad, D.I.C.T.A., A.I.C.T.A., M.Sc. (Br. Columbia) Ph. D (Nottingham)
Chemist	E.J.A. Khan, B.Sc. (Edin), M. Sc. (Wales).
Chemist	Vacant
Agricultural Economist	Vacant
Economic Botanist	P. Poonai, D.I.C.T.A., A.I.C.T.A.
Fishery Officer (Research)	
Honorary	R.H. McConnell, D. Sc.
Fishery Officer (Research)	W.H.L. Allsopp, M.Sc. (Wis.)
Fishery Officer (Extension)	E.A. Shepherd
Soil Surveyor	Vacant
3 Agricultural Officers	Vacant
Entomologist	C.P. Kennard, D.I.C.T.A., B.Sc. (McGill), M.Sc.
Plant Pathologist	Vacant
Curator	G.E. Wolstenholme
Senior Field Assistant (Meteorological)	J.E. Isaacs
Senior Field Assistant (Veterinary Division)	C.I. Veerasammy

VETERINARY AND ANIMAL HUSBANDRY

Assistant Director (Veterinary)	E.M. McWatt, D.V.M. (Ont.)
Veterinary Officer	P.F. Byrne, M.R.C.V.S. (Dub)
Veterinary Officer	C.E.O. Fraser, B.V.Sc., M.R.C.V.S.
Veterinary Officer	F.E. Mongul, D.V.M.
2 Veterinary Officers	Vacant
Farm Manager (C.A.S.)	C.A. Bannister, Dip. Agric. (Acting Agric. Assistant)

FIELD AND EXTENSION

Assistant Director (Extension)	E.I. Hugh, B.Sc., M.Sc., D.I.C.T.A., Dip. Agric. (Reading)
Agricultural Officer (Head Office)	O.F. Churaman, D.I.C.T.A., Dip. Extension Education.
Agricultural Officer (Land Settlement and Development)	A.V. Wan Ping, D.I.C.T.A., B.Sc. (Hons.) McGill
Agricultural Officer, East Demerara	B.O. Ho-Yen, M.Sc. D.I.C.T.A., B.Sc. (McGill)
Agricultural Officer, Berbice	H. Madramootoo, B.S.A. (Br. Columbia)
Agricultural Officer, Essequibo	M. Ramnaraine, Dip. of Agric. (Wye)
Agricultural Officer, West Demerara	B.W. Carter, D.I.C.T.A.
Agricultural Officer, (Grasslands)	G.D. Baxter, M. Sc.
Agricultural Officer (Perennial Crops)	H.V.S. Ho-a-Shu, D.I.C.T.A., A.I.C.T.A.
Agricultural Officer (Annual Crops)	Vacant

Agricultural Officer (performing
duties of Agricultural Engineer)
Agricultural Officer (acting as
Agricultural Economist)
Agricultural Engineer

Agricultural Assistant
Agricultural Assistant
Agricultural Assistant
Agricultural Assistant
Agricultural Assistant (Temp.)
Senior Field Assistant

Senior Field Assistant
(Economics)
Entomologist, Rice Storage
Investigations
Sugar Agronomist

V.P. Chung, B.Sc. (Mech Eng.),
M. Sc. (Ag. Eng.)

A.R. Baburam, B.Sc., M.S.C.
Vacant - V.P. Chung M.Sc.
(acting).

H.A. Cole
L.H. Hope
C.K. Roberts, D.I.C.T.A.
M.K. Rayman, D.I.C.T.A.
B.H. Samaroo, D.I.C.T.A.
P.O. Jackson (Acting
Agricultural Assistant)

L.L. Rai, B.A. (Temp.)

L.D. Cleare, F.R.E.S.
N. Ll. Davies, B.Sc. (Val es)

MARKETING DIVISION

General Manager
Chief Accountant
Marketing Officer
Manager, Government Produce
Depot
Dairy Manager
Secretary/Accountant, Milk
Pasteurisation Plant

C.I.V. Mittelholzer
Vacant
L.F. Paul

Vacant
J.E. Riley
D. Seeram (on leave); J.A.
Charles seconded from
Accountant General's Office

SENIOR ADMINISTRATIVE STAFF

Executive Officer
Accountant
Assistant Accountant
Senior Woman Secretary

M.V.A. Spencer
Vacant
H. Timla
Miss M.M. Cheong

OFFICERS WORKING ON COLONIAL DEVELOPMENT SCHEMES

Agronomist
Agronomist
Research Officer (Ebini)
Agricultural Officer (Hosororo
Station)
Agricultural Officer
(St. Ignatius)
Soil Surveyor
Veterinary Officer (St. Ignatius)
Farm Manager (St. Ignatius)
Farm Manager (Ebini)

R. Hewson, B.Sc., D.T.A.
L.E. Palmer, B.Sc., D.T.A.,
A.R.C.S.
S.P. Legg, B.Sc., M.A.
D.E. Gollifer, B.Sc. Agric.
E. Cundiff, B. Sc. Dip.
Agric.
S.A. Harris, B. Sc., M.Sc.
G.D. Paine, M.R.C.V.S.,
Dip. T.V.M.
C.A. Vieira (on secondment
to C.A.S.)
C.C. Hennecart, Dip. Agric.

INTERNATIONAL CO-OPERATION ADMINISTRATION

Extension Specialist
Marketing Adviser
Cacao, Coconut, Coffee Specialist

M.E. Knickerbocker, B.Sc.
D.H. Lee, B. Sc.
J. Wheat, B. Sc.

Rural Credit Specialist
Vocational Agricultural }
Specialists

Rural Youth Adviser
Fisheries Adviser
Agronomy Adviser (Crops)

R.B. Gregg, B. Sc.
A.C. Hale, B.S.A., M. Sc.
L.G. Adams, B. Sc., M.Sc.,
Ph. D.
D.P. Carter, B. Sc.
C.L. Kaufman
Jorge A. Madamba, B.Sc.,
M. Sc.

